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PART IV

ENVIRONMENTAL PROTECTION AGENCY

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TOXIC POLLUTANT EFFLUENT STANDARDS

Standard for Aldrin/Dieldrin, Benzidine, DDT (DDD, DDE), Endrin and Toxaphene; Final Decision

Title 40—Protection of Environment

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

[FRL 668-8]

PART 129—TOXIC POLLUTANT EFFLUENT STANDARDS

Standards for Aldrin/Dieldrin, DDT (DDD, DDE), Endrin and Toxaphene; Final Decision

This is a rulemaking proceeding under § 307(a) of the Federal Water Pollution Control Act, as amended (the "Act"), 33 U.S.C. § 1251 et seq. On June 10, 1976, the Environmental Protection Agency (the "Agency") published proposed regulations pursuant to § 307(a)(2) of the Act, consisting of general regulatory provisions and toxic pollutant effluent standards for four toxic substances: aldrin/dieldrin, DDT (DDD DDE), endrin and toxaphene. (41 FR 23576) The general regulatory provisions (§§ 129.1–129.8) are not "standards" within the meaning of § 307(a) and therefore did not require formal rulemaking hearings. However, the Agency proposed them together with the standards in the belief that permitting public comment on both would result in more informed rulemaking. This decision will deal with both the proposed general regulatory provisions and the proposed toxic effluent standards.

Because filing of this decision has been delayed past the statutory deadline and past the deadline stipulated in the consent agreement in *NRDC* v. *Train*, Civ. No. 75–172, 8 E.R.C. 2120 (D.D.C. June 9, 1976), I have determined in accordance with 40 CFR § 104.14(c) that the preparation and filing of a tentative decision and related procedures pursuant to 40 CFR § 104.14(b) should be omitted.

Background

On July 6, 1973, pursuant to § 307(a)(1) of the Act, the Agency published in the Federal Register a list of nine toxic pollutants: aldrin/dieldrin, benzidine, cadmium, cyanide, DDT (DDD, DDE), endrin, mercury, polychlorinated biphenyls and toxaphene. (38 FR 18044) On September 7, 1973, this list was promulgated by the agency as proposed, together with a discussion of the Agency's selection criteria and a response to the public comments received on the proposed list. (38 FR 24342) On December 27, 1973, pursuant to § 307(a)(2) the Agency published proposed toxic pollutant effluent standards for each of the nine listed substances, together with a discussion of the factors consiedred in setting the standards, and a list of point source categories of discharges proposed to be covered. (38 FR 35388) Because the proposed standards were developed under severe time constraints imposed by the court order in *Natural Resources Defense Council* v. *Train*, Civ. Action No. 849–73 (D.D.C. June 19, 1973, as modified), the Agency lacked sufficient time to develop data in certain areas.

In accordance with § 307(a)(2) of the Act, a rulemaking hearing was held during April and May, 1974. After reviewing the record of this hearing, the Agency concluded that the record did not contain sufficient evidence for promulgation of responsible and defensible standards and that no specific modification could be "justified based upon a preponderance of evidence adduced at the hearings" in accordance with § 307(a)(2) and (3) of the Act. As a result, the Agency decided not to promulgate standards based on this record, but to gather additional data the revise and repropose its toxic pollutant effluent standards. The background and circumstances surrounding this decision are more fully set forth in the preamble to the June 10, 1976 proposal. (41 FR 23576–9)

Each of the proposed standards provides for maximum average daily and monthly effluent standards (or prohibitions); the standards for endrin and toxaphene also include a monthly average mass emission limit. In addition, each standard provides an ambient water criterion; if the effluent standards are not sufficient to achieve the ambient water criterion (because of local receiving water conditions), the cognizant regulating authority may impose more stringent effluent limitations in order to achieve the ambient water criterion.

In the period since the 1974 hearing, the Agency substantially expanded its data base with respect to toxicity and the environmental behavior and effects of the toxic pollutants, including human health effects. The Agency gave further attention to measuring and monitoring technology and reconsidered the hydrological assumptions underlying the standards which were proposed in 1973. In addition, the Agency reassessed its previously accumulated data with respect to the discharge of particular pollutants by particular industrial point source categories.

In light of the claims raised by industry objectors at the previous hearing, the Agency concluded that the interest of responsible rulemaking would be best served by giving at least some consideration to data on available control technologies and the likely impact, if any, of the proposed regulations on the national economy. However, the Agency determined that such factors must be given less weight than the environmental and public health factors required to be taken into consideration under § 307(a)(2) of the Act and for which the standards must provide "an ample margin of safety" as required by § 307(a)(4). (41 FR 23578)

In developing the proposed standards, the Agency collected and considered data relating to "the toxicity of the pollutant, its degradability, the usual or potential presence of the affected organisms in any waters, the importance of the affected organisms and the nature and extent of the effect of the toxic pollutant on such organisms", as required by § 307(a)(2) of the Act. In addition, the Agency considered available data concerning human health effects attributable to the toxic pollutants in response to the Act's manifest concern for protection of public health. After careful and thorough research, the Agency set forth extensive data concerning the toxicity, environmental fate and effects of the four pesticides in "criteria documents", one for each pesticide.

Dr. Leonard J. Guarraia, Chief of the Criteria Branch of EPA's Office of Water Planning and Standards, was responsible for the preparation of each of these criteria documents. In developing these documents, he conducted an extensive review of the scientific literature on both acute and chronic toxic effects of these substances on a wide range of aquatic organisms, consumers thereof and other animals. He gathered extensive data on the persistence, degradability and bioaccumulation of the pollutants in aquatic organisms, the presence of these organisms in various waters, and the importance of these organisms. He visited and contacted the various EPA laboratories throughout the country, and communicated with officials of various other government agencies with an interest or expertise in this area (including the Department of Health, Education, and Welfare, the Food and Drug Administration, and the National Cancer Institute). In addition, he obtained information from the National Library of Medical Information System, the Toxline Data Base, the Chemical Abstract Series, and the Biological Abstract Series. This research effort was carried out over approximately 1½ years prior to the Agency's June 10, 1976 proposal, and the results of this effort are set forth in the criteria documents.

Based upon the data in the criteria documents, the Agency established an "ambient water criterion" for each pollutant which would provide an ample margin of safety for all important organisms likely to be affected by it, assuming a continued or chronic presence of the pollutant at that level in the water. The Agency then established "end-of-the-pipe" effluent standards for new and existing sources which, taking into consideration the likely effects of dilution and dispersion following discharge in areas of mixing ("mixing zones") in the receiving waters immediately surrounding the area of the outfall, will achieve the ambient criteria. The Agency believes that this approach provides the degree of protection required under section 307(a)(4) of the Act without at the same time resulting in excessive and unjustifiable over-regulation.

In those cases where sufficient dispersion and dilution may not take place, the proposed regulations allow the permit-issuing authority to apply a "tightening" variance and impose on a discharger such more stringent effluent limitations as may be necessary in order to achieve the ambient water criterion. The purpose of this mechanism is to assure compliance with the statutory requirements of an "ample margin of safety".

In compliance with Executive Order No. 11821 (39 FR 41501), the Agency

assessed the potential economic and inflation impact of the proposed regulations and concluded that there would be no significant adverse impact on production, prices or users of the four substances at issue in these proceedings. Accordingly, the Agency concluded that preparation of a formal Inflation Impact Statement (IIS) was not required.

In accordance with standard Agency practice and § 307(a)(7) of the Act, EPA circulated drafts of its proposed regulations, the supporting criteria documents and the technology and economic assessments to various other interested federal agencies, including the Departments of Commerce, Interior, Health, Education and Welfare, Agriculture, Defense, and the Office of Management and Budget for interagency review. All comments received were carefully reviewed and considered by the Agency before official publication of the proposed regulations. Following this review and EPA's own internal inter-office review, on June 10, 1976 the Agency reproposed toxic pollutant effluent standards for four toxic substances: aldrin/dieldrin, DDT (DDD, DDE), endrin and toxaphene. (41 FR 23576)

In accordance with § 104.3(d) of the Rules of Practice for Hearings on Effluent Standards for Toxic Pollutants (the "Rules of Practice"), 40 CFR Part 104 (41 FR 17898 et seq.), written comments received by the hearing clerk from the following interested persons were made a part of the record:

Olin (Corporate Health Affairs)
American Cyanamid Company
Dr. William E. Hazeltine
Rohm and Haas Company
National Fisheries Institute, Inc.
Vicksburg Chemical Company
Pesticide Formulators Association
National Agricultural Chemicals Association
Shell Oil Company
State of New York Department of Environmental Conservation
U.S. Department of Agriculture
Ford Motor Company
Manufacturing Chemists Association

With respect to the standards proposed for endrin and toxaphene, the following persons filed timely objections in accordance with § 104.3(a) of the Rules of Practice and were named parties to the public hearing:

American Petroleum Institute
American Iron and Steel Institute
Velsicol Chemical Corporation

and the following persons who filed one day late were permitted to become parties to the public hearings:

Hercules Incorporated
Environmental Defense Fund
Natural Resources Defense Council, Inc.

The validity of the approach taken by the Agency in developing the proposed standards was criticized in various regards by the commenters and the parties to the hearing. Their objections are discussed below.

The rulemaking hearing began within 30 days (as required under § 307(a)(2)) on July 9, 1976 and was continued thereafter on July 26, 27, 28, 29, and 30; August 2, 3, and 4; September 13, 14, 15, 16, 20, 21, and 22; and October 12, 1976. At these hearings, the Agency presented the testimony of twelve expert witnesses. Hercules, Inc. ("Hercules"), the nation's largest manufacturer of toxaphene, presented the testimony of six witnesses. Velsicol Chemical Company ("Velsicol"), the nation's only current manufacturer of endrin, presented the testimony of four witnesses, while the Environmental Defense Fund ("EDF") presented the testimony of one witness. No witnesses were presented by any of the other parties.

Under § 307(a)(2) the Administrator must promulgate each of the proposed standards unless he finds, on the record, that a modification of one or more of such standards is justified based upon a preponderance of evidence adduced at the hearing. This decision will set forth findings of fact and conclusions as to whether modification of any of the standards is justified, based upon a preponderance of the record evidence adduced at the hearing.

Findings of Fact and Conclusions

Aldrin/Dieldrin, DDT, DDD and DDE

1. The toxic pollutant effluent standards proposed for manufacturers and formulators of aldrin/dieldrin, DDT, DDD and DDE require a prohibition on aldrin/dieldrin, DDT, DDD and DDE in any discharge from any such manufacturer or formulator, for both existing and new sources. (§ 129.100 and § 129.101 of the proposed standards.)

2. The Agency's statement of basis and purpose in support of these proposed standards was set forth in the preamble to the proposed standards. This statement incorporated by reference the EPA criteria documents for aldrin/dieldrin and for DDT (DDD, DDE) and summarized their content. These criteria documents, together with the references cited therein, document extensively the fact that aldrin/dieldrin, DDT, DDD and DDE are extremely toxic, that they are persistent and mobile in the environment, that they bioaccumulate in aquatic organisms, and that they pose substantial risks to human health. The statement of basis and purpose also summarized and incorporated by reference technology assessments prepared by Midwest Research Institute entitled "Wastewater Techonology Documentation for Aldrin/Dieldrin Manufacture" and "Wastewater Technology for DDT Manufacture", a study prepared by the EPA Office of Water Planning and Standards entitled "Wastewater Treatment Technology Documentation", and a report prepared by Arthur D. Little, Inc. for EPA entitled "Economic Assessment of Proposed Toxic Pollutant Standards for Manufacturers and Formulators of Aldrin/Dieldrin, DDT, Endrin and Toxaphene". The Agency's statement of basis and purpose establishes that the standards proposed for manufacturers and formulators of aldrin/dieldrin and DDT, DDD and DDE are technologically feasible, and that compliance therewith will not result in substantial or unreasonable adverse economic impact.

3. No objections to the standards proposed by the Agency for aldrin/dieldrin or for DDT, DDD and DDE were filed with the hearing clerk. Some comments addressed to the standards in general or to the aldrin/dieldrin and DDT standards in particular were submitted to the hearing clerk pursuant to § 104.3(d) of the Rules of Practice. These comments are discussed in the Summary of Written Comments.

4. One of the factors considered by the Agency in proposing a standard prohibiting DDT in any discharge from any DDT manufacturer was the apparent absence of any known present direct discharge. Rohm and Haas Company submitted a comment indicating that they are a former DDT manufacturer and utilize DDT in the manufacture of other pesticide products. Thus this company is a "DDT manufacturer" within the meaning of § 129.101(a)(2) of the proposed standards.

Apparently Rohm and Haas has no problem with the proposed standards insofar as they apply to its current use of DDT in the manufacture of other pesticides. Rather, they state that DDT which accumulated in the soil during the period when they manufactured it slowly infiltrates the below-ground network of cooling water system pipes that service the plant. The cooling water system draws water from the Delaware River and returns water containing "minute traces" of DDT to the river. Rohm and Haas believes that none of this DDT contamination results from its current manufacturing operations.

In a meeting with representatives of Rohm and Haas prior to the deadline for becoming a party to the hearings, Agency personnel informed the company that this contaminated discharge would be subject to the proposed regulations. Nevertheless Rohm and Haas did not appear or present any evidence at the hearing to support a modification of the proposed standards, but simply indicated in their comment that their cooling water discharge could not comply with a zero discharge standard.

They stated that because of the extremely large flow and very low level of DDT in the cooling water discharge there is no method of removal that is technologically or economically feasible. Their comment, however, did not consider the possibility of achieving compliance with the standard by replacing, shielding or lining the pipe from which DDT residues are being discharged, all of which the Agency believes would be feasible approaches to the problem. Moreover, Rohm and Haas submitted no information to the Agency to demonstrate the safety of a non-zero discharge.

5. No evidence of record from Rohm and Haas or any other commenter warrants any modification of the standards

proposed by the Agency for aldrin/dieldrin or DDT (DDD, DDE) "based upon a preponderance of evidence" in the hearing record.

Endrin

1. Endrin is a chlorinated cyclodiene pesticide widely used for control of pests such as the boll weevil and the sugar cane borer on cotton and sugar cane crops. Although its use has decreased in recent years due to the resistance developed by target species, it is still used alone or in combination with other pesticides for the control of some pests in some areas. Because it is non-polar, endrin dissolves more readily in fat than in water, a property common to organic pesticides which bioaccumulate. Endrin can be strongly adsorbed by particulate matter, a property of considerable importance for its distribution between the water and sediments of receiving water bodies. It has been shown that endrin is resistant to leaching from bottom sediments and from watersheds to which it has been applied.

2. Extrapolation from the effects found in laboratory and field testing is a reliable means for predicting effects of endrin on individual organisms and their food chains and is recognized as such by the scientific community. Bioassays are probably the most useful technique available to the biologist for predicting the potential hazard of a chemical in the laboratory. They range from relatively simple acute static and flow-through bioassays to complex chronic entire life-cycle and community bioassays. Laboratory bioassay tests may underestimate the toxicity of pollutants as compared with results obtained from field tests if (as may be the case under optimal bioassay conditions) bioassay test animals are well-fed, free of disease or injury, and free of stress caused by the presence of predators and/or physical conditions. On the other hand, laboratory tests may overestimate toxicity if the animals tested are stressed by the test environment. In the absence of studies or hard data demonstrating that laboratory tests either overestimate or underestimate toxicity, it is reasonable to assume that such tests correctly assess toxicity. Moreover, there are numerous variables in the field which could possibly enhance or decrease the toxicity of a substance. Thus, for instance, one study found that the toxicity of endrin to the fathead minnow was increased in hard water. Laboratory tests control such variables and permit the only practical basis for formulation of standards.

3. The LC 50 is the dose concentration which is found to be lethal to fifty percent of a test species population over a specified period of time. LC 50 values reported for static tests are likely to be substantially higher than LC 50 values for flow-through tests. This suggests loss of toxicant in static bioassays. Because "container wall" effects are likely to be negligible and the volume of water per fish is much greater, flow-through bioassays more accurately reflect the natural environment.

4. Toxic effects resulting from the presence of endrin in water have been documented for aquatic organisms representing a wide phylogenetic cross section and geographic distribution. Although the test organisms may not all be universally distributed in the waters of the United States, they represent types of organisms present in fresh, marine and estuarine water bodies throughout the country. Thus, while available data may not be present for either the most sensitive or most important organism at a given geographical location, the data are indicative of predictable toxicological effects in the aquatic environment.

The acute toxicity of a wide variety of aquatic invertebrates to endrin is set forth below:

Organism	Habitat	Duration (hours)		Concentration (ug/l)
Stonefly	(FW)			
Acroneuria pacifica		96	(F)	0.32
Stonefly	(FW)	24	(S)	4.0
Pteronarcys californica		48	(S)	.96
		96	(S)	.25
Stonefly	(FW)	24	(S)	2.8
Pteronarcella badia		48	(S)	1.7
		96	(S)	.54
Stonefly	(FW)	24	(S)	3.2
Claassenia sabulosa		48	(S)	.84
		96	(S)	.76
Amphipod	(FW)			
Gammarus lacustris		24	(S)	6.4
		96	(S)	3.0
Korean shrimp	(SW)			
Palaemon macrodactylus		96	(F)	.30
Sand shrimp	(SW)			
Crangon septemspinosa		96	(S)	1.7
Grass shrimp	(SW)			
Palaemonetes vulgaris		96	(S)	1.8
Hermit Crab	(SW)			
Pagurus longicarpus		96	(S)	12.0
Oysters	(SW)			
Crassostrea virginica		96	(F)	[1] 14.2
Pink shrimp	(SW)			
Penaeus duorarum		96	(F)	.037
Grass shrimp	(SW)			
Palaemonetes pugio		96	(F)	.63

[1] (EC50).
LEGEND: (S)=static bioassay; (F)=flow-through bioassay; (SW)=saltwater; (FW)=freshwater.

The acute toxicity of endrin to a wide variety of freshwater and marine (saltwater) fish is set forth below:

Organism	Duration (hours)	Type of bioassay	LC50 (ng/l)
Chinook salmon	96	(S)	1.2
Oncorhynchus tshawytscha			
Coho salmon	96	(S)	0.51
Oncorhynchus kisutch			
Coho salmon	96	(S)	0.27
Oncorhynchus kisutch			
Rainbow trout	96	(S)	0.58
Salmo gairdneri			
Rainbow trout	96	(S)	0.90
Salmo gairdneri			
Rainbow trout	96	(U)	0.86
Salmo gairdneri			
Bluntnose minnow	96	(U)	0.27
Pimephales notatus (29.8 mm in length)			
Bluntnose minnow	96	(U)	0.29
Pimephales notatus (40.6 mm in length)			
Bluntnose minnow	96	(U)	0.47
Pimephales notatus (59.8 mm in length)			
Fathead minnow	48	(F)	0.57
Pimephales promelas		(S)	0.77
Bluegill	96	(U)	0.7
Lepomis macrochirus			
Mosquitofish	36	(U)	0.5
Gambusia affinis			
Channel Catfish	48	(U)	1.0
Ictalurus punctatus			
Northern Puffer	96	(S)	3.1
Sphaeroides maculatus			
Mummichog	96	(S)	0.6
Fundulus heteroclitus (42 mm in size)			
Striped Killifish	96	(S)	0.3
Fundulus majalis (40 mm in size)			
American eel	96	(S)	0.6
Anguilla rostrata (57 mm in size)			
Threespine stickleback	96	(S)	0.44
Gasterosteus aculeatus	[2]		
Threespine stickleback		(S)	0.50
Gasterosteus aculeatus	[2]		
Chinook salmon (freshwater)	96	(F)	0.14
Oncorhynchus tshawytscha			
Chinook salmon (saltwater)	96	(F)	0.05
Oncorhynchus tshawytscha			
Sheepshead minnows	96	(F)	0.38
Cyprinodon variegatus	[3] 22	(F)	0.14
Sailfin mollie	96	(F)	0.63
Poecilia latipinna			

Organism	Duration (hours)	Type of bioassay	LC50 (ug/l)
Striped bass	96	(F)	0.094
Morone saxatilis			
Shiner perch	96	(F)	0.12
Cymatogaster aggregata		(S)	0.8
Dwarf perch	96	(F)	0.13
Micrometrus minimus		(S)	0.6
Spot	24	(F)	0.45
Leiostomus xanthurus			
Striped mullet	24	(F)	2.6
Mugil cephalus			
Menhaden	24	(F)	0.80
Brevoortia patronus			
Longnose killifish	24	(F)	0.23
Fundulus similis			
Sheepshead minnow	24	(F)	0.32
Cyprinodon variegatus			

[1] 5 parts per thousand salinity.
[2] 25 parts per thousand salinity.
[3] Days.
LEGEND: (S)=static bioassay; (F)=flow-through bioassay; (U)=undetermined whether static or flow-through bioassay.

As the above data show, static bioassays conducted on aquatic invertebrates resulted in 96-hour LC 50 values ranging from 0.25 μg/l to 12.0 μg/l; static bioassays conducted on fish yielded 96-hour LC 50 values ranging from 0.27 μg/l to 3.1 μg/l. Flow-through bioassays conducted on aquatic invertebrates yielded 96-hour LC 50 values ranging from 0.037 μg/l to 0.63 μg/l. Flaw-through bioassays on fish yielded 96-hour LC 50's ranging from 0.05 μg/l to 0.63 μg/l.

The 28-day LC 50 for sheepshead minnow fry, including exposure as embryos, was 0.16 μg/l. The 30-day TLm (LC 50) values for two species of stonefly, *Acroneuria pacifica* and *Pteronarcys californica*, were 0.035 μg/l and 1.2 μg/l respectively, in flow-through bioassays.

In entire life-cycle flow-through bioassay tests conducted on sheepshead minnow, the fish either died or exhibited other sublethal toxic effects such as early hatching, decreased growth, and decreased fertility of eggs, when exposed to 0.72 μg/l and 0.31 μg/l of endrin in the water. No chronic toxicity data from life-cycle bioassay tests are available for aquatic invertebrates.

The pink shrimp (*Penaeus duorarum*) was found to be the tested aquatic organism most sensitive to the acute effects of endrin, with a 96-hour LC 50 of 0.037 μg/l in a flow-through bioassay.

5. Endrin-associated fishkills have resulted in the death of hundreds of thousands of fish, some of which are of great economic importance and all of which are important links in the food chain. The magnitude of endrin-associated fish mortality is illustrated in the following table, which tabulates data for thirteen endrin-associated fishkill incidents:

Date	Estimated number of fish killed	Types of fish killed (percent)		Location (nearest town or country)
		Game	Nongame	
Sept. 4, 1974	64,526	2	98	Webbers Falls, Okla.
Aug. 18, 1974	3,538	96	4	Tuscaloosa, Ala.
Sept. 10, 1974	2,988	9	91	Lawrence, Ala.
Aug. 17, 18, 1970	858	19	81	Sheffield, Ala.
Aug. 8 through 14, 1974	54,233	3	97	Franklin, Tenn.
Jan. 25, 1974	(1)	100		Cana, Va.
Sept. 3, 1974	31	87	13	Tuscaloosa, Ala.
Sept. 12, 1974	13,592	60	40	Sawyersville, Ala.
Aug. 20, 1974	47	72	28	Greensboro-Hale, Ala.
Sept. 9, 1974	28,248	3	97	Decatur, Ala.
Sept. 15, 1974	4,216	28	72	Cullman, Ala.
Aug. 17, 1974	14,350	42	58	Hokes Bluff, Ala.
Aug. 4, 1974	29,747	9	91	Selma, Ala.

[1] Unknown.

The types of fish killed ranged from game fish, such as crappie and bluegill, to non-game fish important in the food chain, such as the mosquitofish.

The cause of the 1963 fishkill in the lower Mississippi River was shown to be due to endrin, whose discharge to the Mississippi River was traced to the Velsicol Chemical Corporation plant at Memphis, Tennessee.

6. Endrin is also toxic to other organisms and consumers of aquatic life, including humans. In one study, 95 percent of eleven species of predators (including fish, frogs, turtles and snakes) died when they were force-fed endrin-resistant mosquitofish containing endrin at 890 μg/kg. Another study, noting the absence of top predators such as bass and crappie as well as very large numbers of mosquitofish in an area contaminated by insecticides (including endrin), indicated that a bioaccumulation of insecticides in the food chain can result in population shifts.

When endrin was re-introduced in 1974 for cotton insect control in the Lower Mississippi River Valley, the population of brown pelicans (fish predators who would have received endrin by the way of the food chain) began to decline. Chemical analyses of the brains of dead birds revealed levels of endrin which could account for their deaths.

Birds fed single endrin doses in capsules had LD 50 values ranging from as low as 1.8 mg/kg for young pheasants to 2.0 to 5.0 mg/kg for pigeons and 5.6 mg/kg for mallards. Birds fed endrin daily in their food for 5 days at the stated concentrations resulted in LC 50 values ranging from 11 mg/kg (endrin in diet) for pheasant chicks, 15 mg/kg for bobwhite quail chicks and 21 mg/kg for mallard ducklings.

Oral LD 50 values for a variety of mammals are set forth below:

Organism	Test	Concentration (milligrams per kilogram)
White rat (male) (Sherman strain).	Oral LD50	17.8
White rat (female) (Sherman strain).	do	7.5
Rat (Carworth strain).	do	7.3-43
Guinea pig (female)	do	16
Guinea pig (male)	do	36
Rabbit	do	5-10
Dog (Beagle)	Oral LD50 (death within 6 weeks).	10
Monkey	Oral LD50	3

Endrin can cause convulsions or death in humans following consumption of contaminated foods, inhalation or sorption. Convulsions have been reported to begin at blood levels of 0.053 μg/ml. (However, there is rapid elimination of endrin from the blood.) The Food and Drug Administration has established an action level of 0.3 ppm (mg/kg) in the edible portion of fish and shellfish to protect human consumers from endrin poisoning.

7. There is some date available on the question of whether endrin is carcinogenic or teratogenic. Evaluation of the data is not complete. On July 27, 1976 the Agency issued a Notice of Rebuttable Presumption Against Registration of Pesticide Products Containing Endrin ("RPAR"). (41 F.R. 31316) Conflicting evidence as to carcinogenicity of endrin was summarized in the RPAR. A RPAR does not constitute a decision by the Administrator that a substance is in fact carcinogenic; it is simply a notice indicating that there is evidence to that effect and requesting comment and rebuttal.

At the time of issuance of the RPAR, the Agency was also aware of studies done by the National Cancer Institute ("NCI") with endrin and toxaphene on rats and mice. Dr. Guarraia's office first learned of these studies in January, 1976. The Agency was unable to take NCI's studies into consideration in formulating the proposed standards because NCI declined to make any information available to the Agency. Moreover, throughout the hearings NCI declined to testify as to the study. NCI's reason for declining to make information available or testify was that it had not completed its analysis of the study.

However, EDF obtained from NCI (under a Freedom of Information Act request) and delivered to EPA on July 21, 1976 computer printouts dated July 9, 1976, with each page stamped "INCOMPLETE-NOT VERIFIED", relating to the NCI studies of endrin on mice and rats.

At the hearing EDF presented the testimony of Dr. Melvin D. Reuber, a pathologist who was and is a consultant to the Agency. Dr. Reuber testified with respect to the FDA rat study mentioned in the RPAR that in his judgment this study demonstrated that endrin is carcinogenic in Osborne Mendel male and female rats.

With respect to the NCI rat study, Dr. Reuber testified that:

> In my opinion, there are serious shortcomings in the NCI endrin study on male and female Osborne Mendel rats which preclude any conclusion beyond the suggestion that endrin may be tumorigenic, particularly for the endocrine system. Additional analysis is needed of the tumors in the Uncertain—benign or malignant category, and of the reported liver lesions, as well as pooling of control rats, before any further conclusions can be drawn from this study. Nevertheless given the statistically significant incidence of malignant tumors observed in the same species in the FDA endrin study, I have concluded that endrin is carcinogenic in male and female Osborne Mendel rats.

With respect to the NCI mouse study, Dr. Reuber testified that there were increased incidences of tumors in males fed high dose levels, but that in his judgment further analysis of the data was necessary to determine whether endrin was tumorigenic in mice.

Thereafter, on October 12, 1976 Dr. Reuber testified that the NCI pages marked "INCOMPLETE-NOT VERIFIED" had been verified as of September 21, 1976. As of October 12, however, NCI had still not made a final judgment about the data and issued a final report on this study and it continued to decline to testify about it.

It cannot be overemphasized that to determine whether a substance is a carcinogen is not a simple matter; it requires careful interdisciplinary analysis and evaluation of the results of studies and their methodology. There is considerable disagreement in the scientific world as to the meaning and interpretation of data such as those available for endrin in this case. As important consequences flow from the determination that a substance is a carcinogen, the Agency has established procedures for making such determinations. Review of endrin under the Agency's Interim Administrative Procedures for Regulatory Decisions Involving Suspected Carcinogens ("Interim Policy"), 41 FR 21402 et seq., has not been completed.

It may be useful to review the procedures set forth in that document. The Interim Policy emphasizes that the decision-making process with respect to regulation of a carcinogen is a two-step process. First, a decision must be made as to whether a substance constitutes a cancer risk. Then, a determination must be made as to what regulatory action, if any, should be taken to reduce that risk.

For § 307(a) standards, an assessment as to the cancer risk would be made under Appendix I of the Interim Policy. The purpose of this assessment is to provide a judgment concerning the weight of evidence that an agent is a potential carcinogen and, if so, how great an impact it is likely to have on human health. Judgments as to the weight of evidence involve considerations of the quality and adequacy of the impact on public health at current and anticipated levels of exposure. The Interim Policy points out that the available techniques for assessing the magnitude of cancer risk to human populations on the basis of animal data are only very crude due to uncertainties in the extrapolation of dose-response data to very low dose levels and also because of differences in levels of susceptibility of animals and humans. Thus the Interim Policy requires that a range of estimates be given on the basis of several modes of extrapolation. Expert scientific judgments in the areas of toxicology, pathology, biometry, and epidemiology are required to resolve uncertainties about the quality, adequacy and interpretation of the data on which the risk assessment is based.

The estimates of cancer risk must include an analysis of the possible modes of exposure of humans to the substance. The decision must be subjected not only to internal and inter-agency review, but to review by the Cancer Assessment Group ("CAG") and in appropriate circumstances to external scientific review. The CAG is an advisory body of senior Agency scientists with a liaison member from the Department of Health, Education, and Welfare, which consults government and private sector experts as needed.

In the Denial of Interlocutory Appeal issued earlier in this proceeding, I ruled that in order to support a rule under § 307(a) I must propose the rule on the basis of "substantial evidence". I determined that the evidence as to carcinogenicity and teratogenicity cited by EDF had not been sufficiently assessed and analyzed to rise to the qualitative level upon which a § 307(a) standard can be based. As discussed in that Denial, the mere fact that data support a RPAR does not make them adequate to support a § 307(a) proposal. I felt that I was faced with a choice between moving toward promulgation, in accordance with a court order and after a three-year delay, of responsible, well-developed and defensible standards under § 307(a) of the Act (namely those proposed) or to once again suspend the proposed standards for endrin pending further development of the evidence suggesting carcinogenicity and teratogenicity. I determined that it was important for the protection of the aquatic environment to proceed expeditiously toward issuing the proposed stringent standards for endrin.

The procedures established in the Interim Policy have still not been completed for endrin. Moreover the Agency has still not received from NCI its final report on its mouse and rat studies with endrin. While recognizing the qualifications of Dr. Reuber, I cannot delegate my decision-making authority to him, and believe that it would be irresponsible to make a determination as to the carcinogenicity of endrin without further review and evaluation of all available data, including the report of NCI when available.

Even if it were determined that endrin was a carcinogen, a decision that a cancer risk may exist does not mean that the Agency will automatically take regulatory action. While it is true that there appears to be no "no effect" level for carcinogens and that therefore human exposure should be minimized, the Interim Policy points out that Congress has not in all cases required complete elimination of risk, because in many areas risks cannot be eliminated without unacceptable social and economic consequences. Thus, while the Delaney Clause of the Pure Food and Drug Act imposes an absolute ban on any food additive that shows evidence of tumorigenic activity for humans or animals, the Federal Insecticide, Fungicide and Rodenticide Act requires a balancing of risks and benefits as the basis for final regulatory action.

It is the position of the Agency that § 307(a) does not require the zero discharge of every substance for which a cancer risk is found. Section 307(a) allows a balancing test to be used, for it directs the Administrator to take into account the importance of the organisms affected when setting an ample margin of safety. Where humans are not likely to be significantly affected by a discharge, so that human exposure is "minimized", the

Administrator may in his discretion set a standard of less than zero discharge.

In the case at hand, with the application of the proposed standard the level of exposure to humans will be slight, but again it must be emphasized that the analysis of the impact of discharges on human health required by the Interim Policy has not been completed for either endrin or toxaphene. No evidence in this regard was introduced in these hearings. The proposed standards must be reviewed and if appropriate revised at least every three years (§ 307(a)(3)). Thus, if after review of all data endrin is deemed to be a carcinogen and if it is determined that the proposed standard is inadequate for the protection of human health, it can be revised promptly.

Accordingly, the Agency believes that no modification of the standard is warranted at this time.

8. Endrin may be transported to water bodies by direct discharges from manufacturing plant effluent pipes, by drifting air sprays applied to agricultural fields, and by runoff from treated soils. In a 1967 study of Louisiana watersheds, it was found that endrin residues in water appeared to parallel land application of endrin. Residues as high as 870 μg/kg were reported in gizzard shad, in the Chevreuil basin.

Where volatilization and photodecomposition opportunities were minimal, endrin was shown to persist in soil for as long as fourteen years and in water for as long as nine years. On the other hand, it was reported that 10–80 percent of endrin decomposed on air dried soil at 25° C in 12 hours, primarily due to transformation of endrin to the ketone and aldehyde forms. Ultraviolet light also degrades endrin to a ketone. Various soil microorganisms can degrade endrin, although it has been suggested that high rates of application might destroy soil organisms which might otherwise decompose endrin. Studies of soils have consistently shown low or absent endin residues since the mid-1960's.

A single application of 3 to 6 pounds of endrin per acre produced residues in potatoes grown in the soil during the first two years. About 80 percent of the endrin residue in Irish and sweet potatoes was found to remain after twelve weeks in storage.

9. Plants, fish or animals may bioaccumulate endrin. Transfer of endrin from water to organism or sediment and from organism to organism has been shown to occur. Endrin-resistant strains of food organisms have been shown capable of transferring lethal doses of endrin to birds. Bioaccumulation levels in fish found in nature have been reported as high as 12,000 μg/kg of dry body weight.

One study found that while lethal concentrations of endrin in a pond became undetectable in the water within one month and in the mud within two months, fish kept in cages in the pond after no more of the pesticide was detected in the water column accumulated detectable levels of endrin within four days. Whether the endrin came from the water, mud or food organisms was unknown.

When a single endrin-resistant mosquito fish was exposed to a concentration of 1,000 μg/l of endrin and then released into tap water with five susceptible fish, all except the resistant fish died within forty hours.

Four algal species have been shown to concentrate endrin about 170-fold following a seven-day exposure to 1 mg/l of endrin.

Oysters exposed to endrin at 1 μg/l for 10 days concentrated endrin about 1,000 times. The uptake of pesticides by oysters in a Louisiana estuary was found to be dependent upon temperature (low temperature yielded low uptake) and rainfall (heavy rainfall increased uptake due to sediment input and roiling).

Spot exposed to 0.05 μg/l of endrin for eight months accumulated whole body residues of 67 μg/g. A second test of five months duration produced residues of 78 μg/g, a concentration factor of 1560. In 96-hour experiments performed on the oyster, the pink shrimp, the grass shrimp, the sheepshead minnow and the sailfin molly, it was found that, while the oysters and shrimp bioaccumulated endrin to a lesser extent than the fish, tissue concentrations of endrin in the test species generally ranged from 200 to 4,500 times the measured concentration in exposure water. Concentrations in sheepshead minnow fry after 28 days were 3,300 to 4,800 times the concentration in water. Fathead minnow exposed to 0.015 μg/l of endrin accumulated concentrations 10,000 times greater than the water. Residue accumulation up to 10,000-fold was found in flagfish exposed for 60 days to concentrations of 0.05 to 0.3 μg/l.

The concentration of endrin in adult medaka tissue has been found to be 17,000 to 26,000 times the water concentration. Since this degree of accumulation was based solely on observations of uptake directly from the water, it did not allow for accumulation via the food chain. Accumulation rates could be higher in other, untested fish species.

10. On the other hand, endrin has been found to be eliminated quickly after termination of exposure. Residues in channel catfish were reduced 95 percent within 13 days after addition of endrin to the water was stopped. Residues of 78.0 ppb were reduced below detectable levels in marine spot within 13 days. Residues in steers with body fat residues of 900 μg/kg declined to 300 μg/kg after six weeks. Ninety percent of endrin given intravenously in rats was eliminated, 75 percent in the first day.

11. In order to protect aquatic organisms (including the food chain supporting them) and consumers of aquatic life (including humans) from the effects of a pollutant, it is necessary to set a maximum level of that pollutant in the water. Such a maximum level is referred to as an ambient water criterion. Ideally such a criterion would be based upon chronic toxicity data showing the "no effect" level for the most sensitive organism to be protected. However, often only acute toxicity data is available. In such cases, the use of "application factors" has been recommended. The "application factor" is applied against the acute toxicity value (normally the 96-hour LC/50) of a particular substance for the most sensitive species to be protected. The resultant figure is the ambient water criterion for that substance, which is intended to be a concentration level which will protect all species from chronic toxicity. The National Academy of Science has recommended use of an application factor of 0.01 for organochlorine pesticides, except where there is an experimentally-derived application factor (in which case such factor should be used).

It has been suggested that experimentally-derived application factors be obtained by dividing the no-effect level by the 96-hour LC 50. Using this method one researcher has found an application factor for endrin of 0.3, using the sheepshead minnow. Another researcher has found an application factor for endrin of 0.26 to 0.35, using the freshwater flagfish. No experimentally-derived application factor has been established for the pink shrimp (the most sensitive species for which toxicity data are available) or any other invertebrate.

12. In developing the proposed ambient water criterion, the Agency used an application factor of 0.1 instead of the application factor of 0.01 recommended by the National Academy of Sciences, because the NAS factor appeared to be overprotective in light of the experimentally-derived factors of 0.3. The 0.1 application factor was applied against the 96-hour LC 50 for the pink shrimp (0.037 μg/l) to produce the proposed ambient water criterion of 0.004 μg/l. Other fresh and salt water organisms have 96-hour LC 50 values in the vicinity of 0.037 μg/l, e.g., the chinook salmon (0.05 μg/l in salt water and 0.14 μg/l in freshwater), the striped bass (0.094 μg/l) and the dwarf perch (0.13 μg/l).

Dr. Guarraia testified that in deriving the proposed ambient water criterion for endrin of 0.004 μg/l, he considered the experimentally-derived application factor, the fact that endrin has been shown to bioaccumulate in fish flesh by factors as high as 26,000, the protection of consumers (including man) and of aquatic life, and the toxicity of similar levels of endrin to a variety of other fish. He also testified that essentially the same criterion was recommended by the EPA's laboratories in Duluth, Minnesota and Gulf Breeze, Florida. Velsicol presented testimony of its witness, Dr. Kenneth Macek, an aquatic toxicologist, that the 0.3 application factor should be used and furthermore that separate criteria should be established for freshwater and marine organisms. He testified that it was valid to use the 0.3 factor (derived from studies of fish) as an application factor for invertebrates. Using the 0.3 factor and the lowest reported 96-hour LC 50's (the pink shrimp, 0.037μg/l and the chinook salmon, 0.14 μg/l) would yield an

ambient marine criterion of 0.01 and an ambient freshwater criterion of 0.04. Dr. Macek testified that these criteria would be adequate to protect freshwater and marine aquatic life, respectively, with an ample margin of safety.

It is true that the NAS recommends use of an experimentally-derived factor when acute and chronic data are available. However, experimentally-derived application factors, like general application factors, can only estimate the no-effect level for species other than those from which the application factor is derived. When this estimate appears to be inadequate it should not be blindly accepted.

The experimental data indicated at least in one instance that a standard based on the experimentally-derived application factor would not in fact provide for the protection of aquatic life. A study of the stonefly (a freshwater invertebrate) showed that 50 percent of the test population was killed when exposed for a 30-day period to a concentration of 0.035 μg/l. Thus the 0.04 ambient freshwater criterion proposed by Dr. Macek would not protect the stonefly.

Velsicol points out that the stonefly in question is found only in cold mountain streams and not in the Mississippi where it could be affected by Velsicol's discharge. Though true, this is irrelevant. The importance of the stonefly data is that it demonstrates that the 0.3 application factor does not correctly estimate the no-effect level for all fresh and saltwater organisms. Although the stonefly may not be found in the Mississippi, other organisms as sensitive as the stonefly may well be found there. The most sensitive and important organisms may easily have escaped testing, since only a small percentage of the total number of aquatic species can be subjected to toxicological testing and since laboratory conditions dictate the use of organisms suited to captivity. The stonefly data indicates that the 0.3 application factor would not "provide an ample margin of safety." The 0.1 factor used by the Agency does provide an ample margin of safety.

Moreover, the 0.3 application factor has been derived for fish and it is not clear that it can validly be applied to invertebrates. Dr. Donald Mount, Director of the EPA Research Laboratory—Duluth, is one of the leading experts on bioassay techniques and methods of determining water quality criteria. As a witness for the Agency, he expressed some qualifications with respect to the transfer of application factors derived from chronic bioassays with fish to invertebrates, in the absence of chronic data for the latter. While acknowledging that similarities were observed between experimentally-derived application factors for fish and for invertebrates, Dr. Mount clearly emphasized the limitations of such an application, saying it was his opinion that the validity of the application factor for various species of fish is better than it is for one determined for fish but applied to invertebrates.

David J. Hensen, a Research Aquatic Biologist at the U.S. Environmental Research Laboratory in Gulf Breeze, Florida, testified that the application factor of 0.1 recommended in the EPA Criteria Document was more appropriate than the 0.3 experimentally-derived application factor to assure adequate protection of aquatic organisms and their consumers because the pink shrimp is an invertebrate with a very high commercial value. It is one of the principal species of shrimp marketed for human consumption. Pink shrimp collected from the South Atlantic and Gulf states accounted for nearly 44 percent ($208.6 million) of the total value of the U.S. shellfish landings in 1975. The pink shrimp is also important as a link in the food chain, since it is eaten by various fish species such as the speckled trout, the white trout, the croaker and the drum.

Accordingly, the record does not establish by a preponderance of the evidence that the proposed ambient water criterion should be modified.

13. The mass emission standard as proposed was based on a 6 million pound production rate and a wastewater flow stream of 300 gallons per minute (gpm). The evidence showed that the total wastewater flow volume from Velsicol's endrin manufacturing plant, including both contaminated and uncontaminated streams, is 259 gpm, based upon evidence presented by Velsicol, and that production is approxiately 3 million pounds.

As stated in the preamble of the June 10 proposal, the purpose of the mass emission standards is to prevent a manufacturer from utilizing dilution instead of treatment or in-process change to achieve compliance with the concentration standard, rather than to impose an additional limitation more stringent than the concentration standard.

If the calculation used to derive the proposed mass emission standards were recomputed using the low range of the endrin production volume (3 million pounds per year) and the total wastewater volume from the endrin manufacturing plant (including both contaminated and uncontaminated streams of 259 gpm), a somewhat more relaxed mass emission standard would result, namely .0006 kg/kkg for existing sources, and .00004 kg/kkg for new sources.[1]

[1] This calculation is performed as follows:
Daily flow of 259 gpm×1440 minutes per day=.373 million gallons per day (MGD).
Maximum permissible amount of endrin in discharge from endrin plant is .373 MGD × concentration standards (1.5 μg/1) × conversion factor from gallons to pounds (8.33) =.00466 lbs. per day.
3 million lbs. per year divided by 365 days per year=8.22 thousand lbs. production of endrin per day (if weekend days were excluded the figure would be higher, imposing a slightly more stringent limitation.)
Maximum permissible mass emission is .00466 lbs. per day divided by 8.22 lbs. endrin produced per day=.0006 lbs. per thousand lbs., or kg/kkg.
Since the new source concentration standard is 0.1 μg/1, the new source mass emission standard is .00006×0.1/1.5=.00004 kg/kkg.

Although Velsicol offered evidence that its total discharge volume averages approximately 2,269 gallons per minute, as discussed below, the evidence discloses that this includes not only the discharge from the endrin plant and the heptachlor plant, but also other discharges which need not be treated with the contaminated streams.

Evidence was introduced by Velsicol indicating that even when their endrin operation is shut down, there is residual endrin in the system, including the pipes, which results in a positive discharge of endrin. When the endrin plant is shut down, there will be no production level on which a mass emission as a percent of production could be calculated. Under these circumstances, it would be reasonable to require that, during any calendar month for which the endrin manufacturing plan is shut down, the discharger must comply with a mass emission standard under which the production volume used is the average monthly production level for the most recent 360 days of operation of the endrin plan (which approximates an operating year).

In addition there was evidence that there is stormwater flow of 251 gpm which may be subject to the proposed standard. Techniques such as roofing, diking or use of evaporation ponds would obviate the need for treatment of stormwater flows and would be less expensive than treatment. Consequently the Agency does not envision that the mass emission limitation will be applied to stormwater flows.

14. In order to identify and evaluate the wastewater technologies applicable to dischargers from plants engaged in the manufacture or formulation of the pesticides aldrin/dieldrin, endrin, DDT (DDD, DDE) and toxaphene, EPA contracted for the services of the Midwest Research Institute (MRI) of Kansas City, Missouri. MRI is a not-for-profit corporation which is engaged in a wide range of research projects involving the physical, biological, engineering, economic and management sciences. It has performed extensive research on the study of wastewater effluent and wastewater treatment technology, and the costs thereof. The project officer at MRI in charge of preparation of reports for each of the four pesticides at issue here was Dr. Alfred F. Meiners.

Dr. Meiners, who has a Ph.D. in organic chemistry, is a Principal Chemist in the Physical Sciences Division of MRI. During approximately the past ten years, he has devoted extensive time to the study of wastewater containing pesticides and other organic chemicals, and the technologies available to treat those wastewaters for the purpose of removing the organic constituents.

The objectives of the studies which MRI performed for EPA were to examine the wastewater management practices currently employed in the manufacture and formulation of the specified pesticides, to examine the state of the art of potential wastewater treatment processes that might be applicable to the

industry, and to select those processes that would be applicable to EPA control requirements for toxic pollutants. The task included, in addition, the development of cost data relating to existing and proposed wastewater treatment methods. The results of the MRI studies are four reports (one for the manufacturing segment of each pesticide) and the first four sections of a study of the formulator segment of the industry, entitled "Wastewater Treatment Technology Documentation for Aldrin/Dieldrin, DDT, Endrin, and Toxaphene Formulation", prepared by the EPA Office of Water Planning and Standards.

15. In preparation of "Wastewater Treatment Technology Documentation for Endrin Manufacture", MRI considered a total of ten technologies. The four technologies selected for discussion in the report (resin adsorption; reductive degradation; resin adsorption and reductive degradation in series; and activated carbon adsorption) were those believed by MRI to be the most promising in terms of feasibility and likelihood of achieving very low concentration levels of the pesticide in industrial effluents. No candidate technology was rejected on the basis of cost only.

16. Velsicol is currently the sole manufacturer of endrin in the United States and all of its production of endrin is made at its plant in Memphis. This plant occupies a 68-acre site. Velsicol also formulates endrin, but under the regulations is regarded as an endrin manufacturer. (§ 129.102(a)).

17. At the time MRI prepared its report, it believed that Velsicol had two direct discharges (001 and 002) into a stream known as Cypress Creek and a third discharge (003) to the Memphis Municipal Sewage System, all contaminated to some degree with endrin and yielding a total wastewater discharge of approximately 3,514 gallons per minute (gpm), containing an average 2.5 pounds of endrin per day. Production information indicated between three and six million pounds per year of endrin. It was believed that Velsicol expected to reduce soon the amount of contaminated water to 150 gpm or less. The Memphis Municipal Sewage System is not now a "publicly owned treatment works" meeting the requirements of § 301(b)(1)(B) but is expected to become one in February, 1977, or shortly thereafter. For purposes of its cost estimates, MRI used two alternative model systems involving endrin-contaminated flows of 300 and 600 gpm respectively, and used the higher production figure of six million pounds of endrin per year.

18. Velsicol's outfalls 001 and 002 have zero discharge except for endrin-contaminated runoff during rainfall which, during four months of 1976, varier from .008 to 0.145 pounds/month (001) and 0.666 to 1.396 pounds per month (002). Velsicol indicates that in 1976 the stormwater flow (rainy days only) averaged 40 gpm for outfall 001 and 66 gpm for outfall 002. Stormwater from areas immediately surrounding the endrin and heptachlor manufacturing facility is collected and channeled to the plant's process waste treatment system.

Outfall 003 contains an average daily discharge of 2269 gpm with all production units on line at full production rate, with an average of less than 30 μg/l of endrin and usually in the range of 10–15 μg/l, resulting in an average discharge of 0.25 lb/day of endrin. Velsicol within the past year constructed a separate sewage system so as to segregate its endrin and heptachlor process wasteflows. The total discharge from the endrin plant is 259 gpm, and the total discharge from the heptachlor plant is 42 gpm, or a combined flow of 301 gpm. Of this, only 66–100 gpm is actually contaminated with endrin and heptachlor.

The entire 2269 gpm at outfall 003 is contaminated with endrin because of residual contamination of hundreds of yards of the old sewage system now used for endrin-free waters (cooling and noncontact waters). Despite several cleaning with ultra-high pressure water jets, the average effluent discharge was 15–20 μg/l during the four months of 1976 when no endrin was produced. The treated and untreated waste streams are joined together in a common neutralization basin and thence discharged via outfall 003.

19. One of the principal issues in this proceeding is whether and to what extent questions of technology and economic impact are to be taken into account in setting standards under § 307(a). A related question is whether the standards must be technologically achievable within one year. Velsicol argues that toxic pollutant effluent standards under § 307(a) must meet the requirements of § 301(b) and § 304(b). In Velsicol's view its position is adopted in the consent agreement in *NRDC* v. *Train*, Civ. No. 75–172, 8 E.R.C. 2120 (D.D.C. June 9, 1976). Hercules also argues that the Administrator must consider questions of technological and economic feasibility.

The short answer to Velsicol's argument is that nowhere in the statute or the legislative history is there any suggestion that toxic pollutant standards under § 307(a) must meet the requirements of §§ 301(b) and 304(b). The requirements of §§ 302, 307 and 318 are plainly in addition to those set forth in § 301(a), and § 301(a) so indicates:

> Except in compliance with this section [§ 301] and sections 302, 306, 307, 318, 402, and 404 of this Act, the discharge of any pollutant by any person shall be unlawful.

Congress could not have intended the requirements of §§ 301(b) and 304(b) to apply generally to Title III, because the requirements of those sections conflict with other parts of Title III. Section 301(b) sets forth the basic requirements of the Act with respect to waste treatment for point sources, namely that the effluent limitations for point sources must require the application of "best practicable control technology currently available" ("BPCTCA") by 1977 (unless more stringent standards are necessary to meet applicable water quality standards or other requirements) and "best available technology economically achievable" ("BATEA") by 1983. Factors to be taken into account in determining BPCTCA and BATEA are specified in § 304(b). The remaining parts of Title III (insofar as they deal with effluent standards or limitations) are designed to achieve specific goals and for that purpose impose levels of control more stringent, and sometimes on different timetables, than those required under §§ 301(b) and 304(b). Thus, § 302 requires effluent limitations more stringent than those achieved by the application of BATEA if necessary to obtain or maintain water quality. Section 306 requires new sources to meet a special standard, namely "best available demonstrated control technology, processes, operating methods or other alternatives"; standards under this section are effective upon promulgation without reference to 1977 and 1983. Section 307(a) requires the Administrator to promulgate effluent standards for individual toxic pollutants at levels which permit ample margins of safety; these standards take effect within no more than one year of promulgation, again without reference to the 1977–1983 timetable of § 301.

Velsicol's confusion with regard to the relationship of §§ 301, 304 and 307 stems from the fact that toxic substances can be regulated under §§ 301(b) and 304(b) as well as § 307(a). The BPCTCA and BATEA control technologies remove certain toxic substances to some degree, and since toxic substances are "pollutants" the Agency believes that their discharges can be controlled under §§ 301 and 304(b) through appropriate provisions in NPDES permits under § 402.

However, § 301(b) technology is not necessarily sufficient to adequately control toxic substances. (For instance, BPCTCA, which is generally equivalent to secondary treatment, may remove more than 90% of BOD and TSS but only a small fraction of heavy metals.) For this reason Congress gave the Agency additional power to control toxic substances under § 307(a). Thus, when the settlement agreement in *NRDC* v. *Train* provided in clause (A)(1) that:

> • • • the Administrator shall develop and promulgate regulations which shall establish and require achievement at the earliest possible time, but in no case later than June 30, 1983, of effluent limitations and guidelines for classes and categories of point sources which shall require application of the best available technology economically achievable for such category or class, which will result in reasonable further progress toward the national goal of eliminating the discharges of all pollutants, *including toxic pollutants* • • • (Emphasis added.)

the reference to control of toxic substances was a reference to control under §§ 301(b) and 304(b). Control of toxic substances under § 307(a) was separately provided for in clause (K)(14), which states:

The Administrator shall propose standards pursuant to Section 307(a) of the Act for aldrin/dieldrin, DDT (DDD, DDE), endrin and toxaphene on or before May 31, 1976; and for benzidine on or before June 22, 1976; and for polychlorinated biphenyls (PCB's) on or before July 14, 1976. Not later than six months following proposal of each set of such standards, the Administrator shall promulgate final standards for each of such pollutants.

Although it is clear that the requirements of § 301(b) were not superimposed on § 307(a), whether Congress intended the Administrator to consider technology and economics at all in setting § 307(a) standards is a more difficult question. This question was addressed extensively in the preamble to the June 10 proposal (41 F.R. 23578), and the conclusion was reached that the Administrator has the authority:

to give at least some consideration to the economic impact, including the availability of control technology, in setting standards under section 307(a), even though such factors must always be given less weight than the environmental and public health factors for which the standards must, under section 307(a)(4), provide an ample margin of safety.

As discussed below, I have given consideration to the economic impact, including the availability of control technology, and have determined that the standards can be met within one year without significant economic impact.

The Natural Resources Defense Council ("NRDC") argues that consideration of economic costs and technology is not lawful in setting standards under § 307(a). NRDC argues that the Administrator's position should be reconsidered in light of *Union Electric* v. *EPA*, 8 E.R.C. 2143 (C. Ct. 1976), which apparently overruled *Buckeye Power, Inc.* v. *EPA*, 481 F. 2d 162 (6th Cir. 1973), a case which was cited in the preamble.

Union Electric arose under the Clean Air Act and posed the question whether an operator of a regulated emission source could raise claims of economic and technological infeasibility in a petition for review of an EPA-approved State implementation plan ("SIP") filed after the 30-day appeal period. This in turn depended on whether the Administrator could consider such claims in approving or rejecting a SIP. The Court held that the Administrator must approve a plan that provides for the attainment of primary ambient standards within 3 years even if attainment does not appear feasible. In so holding, the Court relied on the fact that Congress had rejected a House proposal to require attainment of primary standards only "within a reasonable time", in favor of a Senate version flatly requiring that primary standards be met "within three years". Furthermore, the Court pointed to the Senate legislative history, which quite explicitly said that existing sources should either meet the standards of the law or be closed down.

The Court also held that economic and technological infeasibility could not be considered by the Agency in approving plans with respect to secondary ambient air standards. The reason for this holding was *not* that the Clean Air Act prohibited consideration of such factors in formulating plans to attain secondary standards. Rather, the Court reasoned that States can if they wish adopt plans more stringent than required by Federal law and hence by implication may adopt plans for the attainment of secondary standards which do not consider economic and technical feasibility. That being the case, the Agency may not disapprove a State's plan for reasons of economic or technical infeasibility.

Though the Agency was thus held to be precluded from considering economic and technological feasibility at the time of approval of a plan, nevertheless the Court discussed in great length the various ways that economic and technological infeasibility could be taken into consideration by States in designing or revising their SIP's or in requesting extensions of time for sources under § 110(e) and § 110(f); also, the Court stated that the Agency could take economic and technological infeasibility into consideration in fashioning appropriate compliance orders under § 113(a)(4) of the Act.

There are several reasons why the holding in the Union Electric case does not require modification of the position adopted in the June 10 proposal;

First, the Administrator's duties under § 110 of the Clean Air Act are ministerial, whereas under § 307(a) they require considerable exercise of discretion. That is, under § 110, if the Administrator determines that the eight criteria necessary for approval of a SIP have been met, the statute makes his approval mandatory. Under § 307(a), by contrast, the Administrator must "take into account" various factors such as the nature of the toxic pollutant and the importance of the organisms affected; he must determine the categories of sources to which the standard will apply; and he must make a determination as to whether the standard provides an ample margin of safety. Thus making a judgment as to the proper toxic pollutant effluent standard under § 307(a) requires the Administrator to exercise substantial discretion.

Second, the Court noted that in fact there are a number of points in the development and implementation of a SIP where allowances for claims of technological or economic hardship could be considered. The State in drafting the SIP is free to take economic or technological factors into consideration. Under § 110(a)(3)(A), the State could grant a variance based, among other things, upon consideration of economic and technological feasibility. The Governor of a State may request postponement of the compliance time on grounds of technological or economic impossibility. As the Court stated in arriving at its conclusion:

In short, the (Clean Air Act) Amendments offer ample opportunity for consideration of claims of technological or economic infeasibility. 8 E.R.C. at 2151.

In contrast, under the Federal Water Pollution Control Act there are no mechanisms by which questions of technological and economic feasibility with respect to the setting of toxic pollutant effluent standards can be taken into account, except through the standard-setting process of § 307(a).

Third, the legislative history of § 110 of the Clean Air Act states in so many words that existing sources should either meet the standard or be closed down. The legislative history of section 307(a), on the other hand, simply indicates that toxic pollutant effluent standards are not to be based solely on questions of economic and technological feasibility. (H. Rept. No. 92-911, 92nd Congress., 2d Sess., at 112-113 (1972)).

Fourth, the nature of the standards is somewhat different. Whereas air quality that does not meet primary air standards causes a direct and immediate impact on human health, discharges of toxic substances may have their primary impact on aquatic systems, with only a secondary impact on humans. Finally, the Union Electric case involved a challenge by a private party to an administrative interpretation of the Clean Air Act. Applying a general principal of administrative law, the Court gave deference to the administrative interpretation of the Clean Air Act (at p. 2146); in Union Electric the administrative interpretation precluded consideration of technological and economic considerations.

NRDC also refers to § 112 of the Clean Air Act, which is the section regulating hazardous air pollutants, for support of its proposition that economics and technology are not relevant to § 307(a) standard setting. Like § 307(a), § 112 contains no express statutory authorization to consider economics and technology. Nevertheless, the Agency has given limited consideration to costs and technology in issuing its national emission standards for vinyl chloride under that section (41 FR 46560). It would be anomalous and inconsistent not to consider these factors under § 307(a) when they have been considered under the comparable § 112.

Consistent with this approach is *Essex Chemical Corporation* v. *Ruckelshaus*, 486 F. 2d 427 (D.C. Cir. 1973). Following *Portland Cement Assoc.* v. *Ruckelshaus*, 486 F. 2d 375 (D.C. Cir. 1973) the Court held in Essex Chemical that in setting national standards of performance for new stationary sources under § 111, the Administrator has not only the power but the duty to consider possible counterproductive environmental effects of its standards despite the absence of any express provision in the statute to do so. This type of consideration would appear implicit as a matter of reasoned rulemaking.

In the present situation, limited consideration of economics and technology gives the Agency some idea of the likely impact of its standards. It also can afford the Administrator some guidance in deciding where on the spectrum of "ample

margin of safety" it would be reasonable and prudent to set the standard. (See 41 FR 23580.)

Thus, for example, the Administrator has set more stringent requirements for new sources than for existing sources. The rationale for this is set forth in the June 10 proposal:

> Setting an "end-of-the-pipe" effluent standard at a level which is substantially less stringent than the chronic criterion recognizes the inherent safety factors built into the latter number, which is derived from direct, sustained exposure of the more sensitive species with no dilution or dispersion allowance. (Clearly) as one backs away from that very stringent number the amplitude of the margin of safety is decreased. Yet the statutory "ample margin" concept is an elastic one which, like the importance of the organism, allows for considerable exercise of judgment by the Administrator in setting the standards. In any case where a discharge is allowed, on the spectrum ranging from certain safety (a prohibition) to that uncertain point where harmful effects are caused and safety ends, a logical break point is struck where the very best that control technology can do is required. Setting a standard at this point, coupled with the "tightening" variance, achieves the purpose of the Act without inflicting unreasonable and unjustifiable economic and social costs. (41 FR 23580)

Hercules and Velsicol argue that any § 307(a) standard must be one that can be achieved within the one-year time limit set forth in § 307(a)(b). They argue that none of the technologies discussed can be installed within one year or at least cannot be installed so as to consistently achieve compliance with the statute within one year.

The one-year timetable of § 307(a) may prove to be unrealistically short for control of some discharges. However, in view of the very serious light in which Congress regarded discharges of toxic substances (as evidenced by the short timetable) it is absurd to interpret § 307(a) as requiring referral of standards when technology is available, but cannot be installed or made fully operational within one year. In any event, the question of whether a standard may be imposed where technology cannot be installed within the statutory timetable need not be reached in this case, because the record demonstrates that technology is available and can be installed within one year. Admittedly problems may be expected in the implementation of any of the available technologies. The fact that the technology may not be functioning perfectly at the end of the one-year timetable is not sufficient reason for deferring the adoption of the standard, but may perhaps be taken into consideration by the courts should any citizens' suits or enforcement actions be commenced against dischargers unable to bring their plants into compliance on time.

20. The resin adsorption system developed by Rohm and Haas Company utilizes a synthetic, polymeric adsorbent known as Amberlite XAD-4 resin to remove pesticides from the wastewater. This resin has a high porosity, a high surface area, and an inert, hydrophobic surface. The adsorbent is regenerated with an organic solvent, and the adsorbed pesticides are recovered in a concentrated form. A pilot plant was scheduled for installation in November, 1976 at the Memphis plant of Velsicol under a grant project funded by EPA.

The MRI report stated that the process has the potential of reducing the effluent concentration down to 1.4 ppb. The manufacturer of resin adsorption systems, Rohm and Haas Company, indicated that such a system can be installed in 42–62 weeks. Because of the experience with the pilot plant at Velsicol it is possible that the system could be installed within one year.

Velsicol's Technical Superintendent, Daniel Marks, testified that although in the laboratory resin adsorption has occasionally achieved endrin removal levels of 0.5 to 0.1 μg/l (one run of tests averaged 1.36 μg/l), nevertheless it had not shown the capability of meeting either the proposed 1.5 ppb standard over an extended period of time or the proposed maximum effluent limitation standard of 7.5 ppb. (This was contrary to his earlier conclusion, in a report describing dynamic column studies, that the XAD resin would achieve reduction to levels near or below 1 ppb.) He said that actual pilot plant data were needed to assess the capacity of resin adsorption technology to reduce endrin content to 1.5 ppb on even a pilot scale basis. However, he also stated that the resin adsorption technology, though not available today in the form of an operational unit that will perform to those levels, nevertheless is a technology which has great potential to be developed in the future to such a state.

In essence, Velsicol's view is that the Agency may not adopt a § 307(a) standard unless technology to consistently achieve that standard has been demonstrated on a full-scale basis using actual wastewater, or at least on a pilot scale basis. I realize that when a standard is promulgated without such a demonstration, there is some chance, however remote, that consistent attainment of the standard will prove difficult or impossible, or that technical problems will take more time to work out than originally envisaged. However, as discussed above, Congress viewed the discharge of toxic substances as a very serious matter, and gave the Agency limited latitude to take into consideration technological feasibility. Under the circumstances I believe that the Congressional intent is most effectively carried out if the Agency establishes toxic pollutant effluent standards on the basis of reasonable expectations as to technological feasibility, and difficulties in attainment of the standard are dealt with and taken account of in the Agency's own enforcement policy and by the courts in enforcement proceedings, if appropriate under all the circumstances. (For instance the nature of the pollutant being discharged and the good faith, or lack of it, of the discharger would be factors to be considered.) This will carry out Congress' intent that toxic pollutant effluent standards be implemented at the earliest possible date, will result in reductions of toxic pollutant discharges even if technological difficulties arise, and will permit dischargers to make their case on the basis of actual as opposed to possible technological difficulties encountered.

21. The reductive degradation process consists of a copper-catalyzed reduction of the pesticide in water by iron. The pesticide-containing wastewater is passed through a packed column with the reductant suitably diluted with inert particles to obtain good flow properties.

Extensive laboratory work with this system has been done by Envirogenics Systems Company ("Envirogenics") of California, and a pilot plant based upon this technology and designed for 100 gpm has been operating at the Velsicol Memphis plant since May 1, 1976. This plant was constructed and installed by Envirogenics as a subcontractor to Velsicol under an EPA grant.

The MRI report stated that the reductive degradation process has the potential of reducing the effluent concentration to 1.0 ppb. This was confirmed by Dr. Keith H. Sweeny. Dr. Sweeny, who has a Ph.D. in physical chemistry, has been employed by Envirogenics and its predecessor for 25 years and holds the position of Manager, Wastewater Treatment Research. He is co-inventor of six patents relating to various aspects of the reductive degredation technology. He has been extensively engaged for seven years in studies to reduce or eliminate pollutants from industrial wastewater, including research into methods to degrade pesticides.

Dr. Sweeney is program manager of the EPA-Velsicol pesticide degradation demonstration grant program. He testified concerning the nature of the reductive degradation process, the results which can be achieved in removing endrin from wastewaters, and the costs of such a system. He described the extensive laboratory work which he has done on the process at Envirogenics. He said, on the basis of his laboratory studies, that this technology could degrade endrin to less than 0.1 μg/l from input concentrations of 300 to 700 μg/l.

During his six years of laboratory studies of reductive degradation technology as applied to endrin, toxaphene, and other chlorinated organic chemicals, Dr. Sweeney achieved varying reduction levels. These results do not, as Velsicol contends, establish that reductive degradation cannot consistently achieve the proposed standard. The varying reduction levels were achieved in tests designed to learn or accomplish things other than actual reduction levels. (For example, some of the tests were run for the specific purpose of trying to exhaust the reductant, or were run with reductants other than the one currently being used.) Dr. Sweeney testified that the results of these experiments (many of which used equipment and parameters entirely different from those presently

used at the Velsicol pilot plant) did not detract from his conclusion that endrin can be consistently removed by the reductive degradation process to levels at or below 0.1 μg/l.

Velsicol takes the position that the pilot plant data to date do not support this conclusion. The pilot plant is being run on 100 gpm of synthetic feed (manufactured by diverting cooling water into the sewer system and relying on its contact with residues to provide endrin and heptachlor in the feed) with an average endrin concentration of 100 ppb. After initial startup problems due to malfunction of a pH control system, the plant operated from May 17 until May 27. These operating results demonstrated that reductive degradation can achieve excellent results, with endrin reduction below 0.1 Ppb. There were, however, problems with the operation of the pilot plant due to plugging. Mr. Marks testified that until the problem of getting adequate flow rates through the bed is solved, operation of the pilot plant cannot be sustained long enough to determine what it average long-term capability will be.

The pilot plant data support MRI's conclusion that reductive degradation has the potential of achieving concentrations of 1.0 ppb in the effluent. There were problems in the operation of the pilot plant, but there is no reason to believe that these problems cannot be solved. Dr. Meiners testified that with respect to a system based upon this or any other of the technologies, there could be problems at the outset including biological fouling, pH upsets, or excessive suspended solids. He also testified, however, that each of these problems could be readily solved. The pH (acidity or alkalinity) of the water can be controlled in a system simply by the addition of acid or alkaline. Biological fouling can be controlled in a number of ways, notably by the use of reagents to retard or prevent growth of microorganisms or by heat. Suspended solids can be removed by sedimentation and filtration. (Installation of sedimentation and filtration. was assumed in the MRI cost study.)

Dr. Sweeny said he could not agree that the pilot plant was inconsistent in its removal because he could confirm neither the analytical techniques and analyses nor the operating conditions. He testified that nothing in Velsicol's testimony regarding operation of the pilot plant would cause him to change in any way his conclusion that a treatment plant based upon reductive degradation technology could achieve reduction of endrin to approximately 0.1 μg/l or below and that such a plant with a capacity of up to 300 gpm could be designed and installed within one year.

Mr. Marks also testified that the reductive degradation process produces new compounds not present in the original feed which are probably chlorine-containing products which may pose toxic risks to aquatic biota comparable to those associated with endrin. He admitted on cross examination that the chemical identity of the by-products was unknown and that he did not know what their toxicity was.

There is no credible basis for this claim. This concern is apparently based on a 1970 study conducted by Sweeny and Fisher for the purpose of analyzing breakdown products of the reductive degradation process for chlorine content. Both Dr. Meiners and Dr. Sweeny explained that their study had been performed under totally dissimilar conditions from those presently used in the reductive degradation system (i.e., different reductant, a column versus a flask concept, and different gas chromatographic conditions). They are currently getting a much more extensive reaction than that which was achieved in the earlier experiment. Dr. Sweeny testified that if a reductive degradation system is operated properly, no chlorine should be left in the effluent. In addition, contrary to Velsicol's statement that Drs. Sweeny and Meiners admitted the possible toxicity of by-products in the effluent, the record is clear that Dr. Sweeny reached no such conclusion, and Dr. Meiners expressed his opinion that such by-products would be relatively nontoxic compared with the pesticide itself.

22. The activated carbon system is not under study at Velsicol's site, but technology available in other industries is believed to be transferable. In carbon adsorption, molecules become attached to the surface of the adsorbent. Granular activated carbon is a highly porous material having a very large surface area. Chlorinated aromatic hydrocarbons such as endrin and toxaphene respond very well to adsorption on carbon.

The MRI report concluded that carbon adsorption technology could achieve only 2 ppb. However, on the basis of testimony presented by Mr. Joseph Rizzo of Calgon Corporation at the hearing I have concluded that carbon adsorption can achieve the proposed standard of 1.5 ug/1 and that it can be installed within one year. Mr. Rizzo is Regional Marketing Director, Calgon Adsorption Systems. Calgon Corporation manufactures granular activated carbon and has pioneered the development and use of the carbon adsorption technology, and Mr. Rizzo has been one of the principal individuals involved in this effort. Over the past fifteen years he has worked on research and design of carbon adsorption treatment systems and processes and holds patents on processes using activated carbon. Mr. Rizzo has investigated the applicability of granular activated carbon to the removal of toxic pollutants including endrin, toxaphene, aldrin/dieldrin, and DDT, DDD and DDE from waste streams.

Wastewater treatment systems based upon the use of granular activated carbon are in use in more than 50 industrial plants throughout the United States. Wastewater flows for these plants range from a low of 6,000 gallons per day to 3 million gallons per day. These systems are removing a wide variety of organic compounds.

In designing a carbon adsorption treatment system, there are at least three approaches available:

(i) Install a carbon adsorption system and discard the activated carbon as it becomes exhausted;

(ii) Install a carbon adsorption system with a reactivation facility on-site—in the case of endrin and toxaphene, this would be by thermal reactivation in a multihearth or rotary kiln furnace;

(iii) Use an adsorption service which is presently available. This service uses modular adsorption units which are designed to meet a variety of flow and organic concentration conditions. The carbon is reactivated by the service supplier at an off-site facility.

The most expeditious of these approaches is the third. Mr. Rizzo testified, based upon his and Calgon's experience with such systems and his familiarity with the relevant isotherm data, that a system using the third approach could be designed and installed to consistently achieve concentration levels in the effluent less than 1 μg/l. He testified that this type of system cannot only achieve compliance with the 1.5 μg/l average daily maximum concentration, but also, if the carbon supply is kept fresh and carbon columns are changed at regular intervals, can assure compliance with a maximum concentration level of 7.5 μg/l at any time.

One of the reasons Mr. Rizzo gave as the basis of his opinion was that there is reliable adsorption isotherm data indicating that carbon adsorption can do even better than 1.5 ug/1 when enough carbon is used in a properly designed system. He also testified that Calgon has been very successful in going from the isotherm data stage to full scale field level, and that Calgon has had success in removing very small concentrations of dissolved organics. Mr. Rizzo testified that Calgon has constructed and operated a treatment system based upon carbon adsorption for the removal of another organic compound in contaminated well waters which reduced the level in a 3 million gallon per day wastewater stream to less than 1.5 ug/1. He also said Calgon has field data demonstrating the removal capabilities of carbon adsorption for polychlorinated biphenyls (also a toxic and persistent chlorinated organic compound), reducing the concentration levels from 50 to 60 ug/1 in the influent to less than 1.5 ug/1 in the effluent.

Calgon has performed isotherm tests which have confirmed the capability of carbon to adsorb endrin from concentrations of 62 ug/1 to concentrations of less than 1 ug/1, and as low as 0.07 ug/1. An adsorption isotherm is a graph of the relationship, at a given temperature and other conditions, between the amount of a substance adsorbed and its concentration in the surrounding solution. A reading taken at any point on an isotherm gives the amount of material adsorbed per unit weight of carbon. From adsorption isotherm data, a determination can be made of whether or not a particular degree of organic removal can be ef-

fected by adsorption alone. Isotherm data will also show the approximate adsorptive capacity of the carbon for the application. Mr. Rizzo testified that the laboratory adsorption isotherm is a reliable technique for ascertaining the feasibility of treatment with activated carbon.

Normally Calgon follows adsorption isotherm studies with granular activated carbon column studies. In the latter, the wastewater to be treated is passed through granular carbon to determine the necessary contact time to assure adequate removal. Calgon has not performed such studies on endrin. These studies can be used as the basis for designing full scale treatment systems.

Mr. Rizzo testified that in actual application Calgon has found that the field results of a full scale system based upon activated carbon adsorption have proven to be at least as good or better with respect to reduction levels achieved than the levels indicated by the isotherm data. However, neither Mr. Rizzo nor Calgon has any experience in employing carbon removal technology on endrin at the full scale level.

Velsicol argued that isotherm data (as opposed to pilot studies using actual wastewater) are inconclusive because the wastewater may contain some constituents which adsorb better than endrin. This presents no serious problem. Mr. Rizzo testified that if this occurs more carbon can be used to effect endrin removal or the columns can be changed more frequently. Although Velsicol might incur a slight increase in cost over a system designed to treat only endrin, the technological feasibility of such a system is not in doubt.

One of the bases for Mr. Rizzo's conclusion that carbon adsorption technology will achieve the standard was the success achieved in the Lake Shawnee incident. Lake Shawnee was a lake which had been contaminated with strychnine and 15 ppb of endrin. It was cleaned with a makeshift carbon adsorption system to less than 1 ppb of endrin. The flow rate was 175–198 gpm. Mr. Marks stated that the Lake Shawnee incident did not give data suitable for designing either a pilot or a full scale carbon adsorption unit; this was because very large quantities were used. Mr. Rizzo disagreed, saying that though large quantities were used they were not spent.

Mr. Rizzo's tremendous experience with carbon adsorption contrasts with that of Mr. Marks, who though experienced in implementation of waste treatment systems has had no experience with carbon adsorption systems. It was Mr. Marks' opinion that none of the three "dynamic" studies nor the isotherm studies showed that carbon adsorption could meet either the proposed effluent limitation of 1.5 ppb endrin over an extended period of time or the proposed maximum of 7.5 ppb. The three "dynamic" studies were the Lake Shawnee incident referred to above, an unpublished study done for Velsicol and a study done by Mr. Marks.

In the unpublished study done by Rykman, Edgerly, and Tomlinson Associates for Velsicol, two columns in series did not reduce endrin below 5 ppbs. However, Agency experts calculated that this study used a contact time of only 30 seconds. Such a study cannot be the basis for a conclusion as to the achievability of a 1.5 ppb standard. Mr. Marks' own study was a column study using synthetic feed. Based on this study Mr. Marks concluded that carbon adsorption would be economically infeasible on the ground that carbon consumption would be 9000 pounds per day, requiring installation of an in-house regeneration facility. (The 9000 pound figure was based on the assumption that 2269 gpm would have to be treated.) There is no support for this conclusion.

Mr. Marks also testified that most reported isotherm data, including those of Bernardin and Froelich relied on by Mr. Rizzo, seriously overstate the removal capability of carbon because they fail to account for the endrin adsorbed to the vessels used to hold the samples to be tested or to the filter and that greater adsorption occurred at lower temperatures. There is no credible foundation for this claim. Mr. Rizzo testified that such adsorption would simply indicate that there would be a lower weight pickup of the material and does not indicate carbon adsorption would not work. He also testified that Calgon had never had to change temperature to increase the effectiveness of a carbon adsorption system and that temperature would have very little technical or economic effect. Mr. Rizzo had no knowledge of whether endrin was left on the walls of the test bottles in the Bernardin and Froelich tests; he said Calgon's lab follows standard procedures and assuming that it was known that endrin would stick to the walls the lab would have used procedures to get the endrin off the walls.

Mr. Rizzo testified that Calgon can design and install a complete wastewater treatment system based on carbon adsorption within 90 days, including prefiltration equipment, and has done it on a number of occasions including a plant with a 3 million gallon per day wastewater flow. Mr. Rizzo reviewed the MRI cost data for carbon adsorption and concluded that the figures were somewhat high because the MRI design calls for a standby adsorber, which a Calgon-designed system would probably not use. With this one exception, he testified that the costs were reasonable.

23. Each of the systems described above would be preceded by sedimentation and filtration facilities so as to remove suspended solids from the wastewater stream. MRI calculated the costs of installing each of these four systems (except carbon adsorption) for two possible wastewater flows: 300 gpm and 600 gpm; it calculated the cost of carbon adsorption for a wastewater flow of 300 gpm only. MRI summarized the costs in Table I of Ex. EPA 8 as follows:

TABLE 1.—*Summary of costs for endrin wastewater treatment systems (1975, dollars)*

Treatment system	Wastewater flow rate (gallons per minute)	Endrin in treated effluent		Installed capital equipment cost	Annual operating cost	Cost per 1,000 gal wastewater	Cost per pound of endrin produced
		Parts per billion	Pounds per day				
Resin adsorption	300	1.4	0.0049	$770,000	$433,200	2.87	$0.072
	600	1.4	.0098	1,260,000	741,300	2.45	.124
Reduction degradation	300	1	.0036	433,000	181,800	1.20	.030
	600	1	.0072	631,000	249,600	.82	.042
Resin adsorption plus reduction degradation	300	0.1	.00036	954,000	537,200	3.55	.090
	600	0.1	.00072	1,541,000	889,700	2.94	.148
Activated carbon adsorption:							
30 min contact time	300	<2	<.0072	692,000	204,000	1.35	.034
60 min contact time	300	<2	<.0072	870,000	242,000	1.60	.040

Velsicol apparently did not find fault with the method by which MRI estimated costs. However, it argued that the costs were underestimated because the flow to be treated was underestimated. As previously mentioned, though Velsicol has segregated its endrin and heptachlor process wastes, the entire 2,269 discharge from outfall 003 is contaminated with endrin because of residual contamination of the sewer system. Thus the determination of the cost to achieve the standards depends on whether or not the entire 2,269 flow must be treated.

Two alternatives were discussed: replacement of contaminated pipes and lining of contaminated pipes. The amount of piping which would have to be replaced to entirely eliminate the problem is 2,400 to 2,800 feet. In 1975 Velsicol spent $1.2 million to put in new pipes in excess of 1,650 feet long. Mr. Sharpe, Plant Technical Service Manager of Velsicol testified that it would not be possible to replace all the contaminated pipes within one year unless perhaps the plant were completely shut down. He admitted, however, that the plant was shut down during the 1975 programs. Although somewhat ambiguous, Mr. Sharpe's overall testimony indicated that even if it might be technically feasible, replacing the contaminated sewer pipes would be very expensive and might result in closure of the plant.

Mr. Sharpe testified that Velsicol had investigated the possibility of "slip lining" the contaminated sewers. This is a technique whereby a high density polyethylene tube is inserted in the pipe and is extruded inside. Velsicol found that the cost for slip lining one 400 foot sec-

tion was of the magnitude of $50,000, assuming no problems were encountered. Also, Mr. Sharpe indicated that slip lining around corners or angles is either impossible or costs a great deal more.

At $50,000 for 400 feet, the total expense to line most of the contaminated pipe would be of the magnitude of $350,000, or more if special problems were encountered. While the record does not contain much evidence on the topic, it does suggest that slip lining of the contaminated pipes would involve considerably lower expense than treating the entire 2,269 gpm flow. Mr. Sharpe estimated the capital cost of treating 2,269 gpm by resin adsorption as $5,157,100; by reductive degradation as $1,506,100; and by carbon adsorption as $2,187,600 to $3,176,800, depending on contact time (30–120 min.). (These latter figures were apparently somewhat over-estimated due to inaccurate computation of carbon requirements). By comparison, the MRI estimate of capital costs for 300 gpm treatment systems were $770,000 for resin adsorption; $433,000 for reductive degradation; and $690,000–$870,000 for carbon adsorption, depending on contact time (30–60 min.). Thus, without even considering the savings in operating costs, it would appear that slip lining would be considerably less expensive than the incremental cost of treating an additional 1,969 gpm. There was no indication in the record as to how long it would take to slip line the contaminated sewer lines, but the Agency believes it would take less than one year.

24. Velsicol argues that stormwater runoff may not be regulated under § 307 (a). Velsicol correctly points out that § 307(a) standards may be applied only to point sources. As provided in 40 CFR 125.52(a)(2) of the regulations, point sources include conveyances which discharge stormwater runoff contaminated by contact with pollutant-contaminated soil, from lands or facilities used for industrial activities into navigable waters or into a separate storm sewer. (This is consistent with *Appalachian Power* v. *Train*, 9 E.R.C. 1033 (4th Cir. 1976), which held that "point source" does not include unchanneled and uncollected surface waters.) The standards issued under § 307(a) will be interpreted and applied in the manner indicated in § 125.52(a)(2). The proposed standards do not apply to stormwater runoff from areas subject to contamination solely by fallout from air emissions of endrin, but only to stormwater runoff from areas subject to direct contamination by endrin as a result of the manufacturing process. (§ 129.102(b)(1)(i)(b) and (ii).) In this regard the proposed standards are also consistent with Appalachian Power, as they define the discharges which are covered.) If as Velsicol alleges, such endrin contamination as occurs in outfalls 001 and 002 does not result from current manufacturing operations, such discharges would not be subject to the proposed standards.

Velsicol argues that the Administrator must specify the point of discharge for its discharges 001 and 002 so that if these discharges are covered by § 129.102(b)(1)(B) it can determine whether it is in compliance with the standard. This question was raised and answered in the Disposition of Motion and Application for Post-Hearing Review dated November 5, 1976. Whether these discharges are subject to the regulations and if so, at what point, are matters properly determined by the Regional Administrator based on consideration of factors specific to Velsicol's site.

Stormwater runoff, to the extent subject to the regulations, can be controlled, as discussed in "Wastewater Treatment Technology Documentation for Aldrin/Dieldrin, DDT, Endrin and Toxaphene Formulation". Velsicol's own witness, Mr. Clyde Sharpe, considered the cost of a collection and impoundment system, presumably as a feasible solution. Velsicol presumably could dike around its immediate manufacturing and loading areas so that none of the runoff reaching outfalls 001 and 002 would be covered by § 129.102(b)(1)(i)(B).

25. The Agency retained Arthur D. Little, Inc. ("ADL"), of Cambridge, Massachusetts, to assist in assessing the potential costs and economic impact of its proposed standards. ADL submitted a written report entitled "Economic Assessment of Proposed Toxic Pollutant Effluent Standards for Manufacturers and Formulations of Aldrin/Dieldrin, DDT, Endrin and Toxaphene" dated May 1976. ADL reviewed the MRI report including the cost figures, and conducted its own independent investigation of the pesticides manufacturing and fomulating industry. In its report, ADL used the MRI cost data, and made appropriate adjustments for treatment already installed, to determine the additional cost of the § 307(a) standards.

ADL concluded that the proposed standards could be met using reductive degredation or resin adsorption, and that using reductive degradation the maximum incremental cost as a percent of selling price would be 0.9 percent (based on a 600 gpm flow). ADL stated that this cost increase would not have an economic impact on either the company or the community. (Cost of 300 gpm treatment was estimated as 0.6 percent). The ADL report concluded that if resin adsorption were used to meet the proposed toxic standards, the 600 gpm treatment cost (3.6 percent) might cause an economic impact. The 300 gpm treatment cost, however, is only 2.0 percent, and there is no reason to believe that such a cost might have a significant economic impact on Velsicol.

The carbon adsorption technology was assumed by ADL to achieve only a 2 ppb standard; the cost to achieve that standard was 0.8 percent (600 gpm) or 0.7 percent (300 gpm). The testimony indicated, however, that the cost of carbon adsorption per gallon of wastewater treated had been underestimated because more carbon would be required to achieve a 1.5 ppb standard.

Velsicol argues that since its production is 3 million pounds per year, not 6 million as assumed by MRI, the cost-to-selling price ratios will increase. However it did not establish the amount by which the ratios would increase and there is no reason to believe it would increase enough to cause a significant economic impact on Velsicol.

To the cost of treatment must be added the cost of dealing with the problem of the contaminated sewers. As indicated above, the cost of slip lining would be in excess of $350,000. By comparison, the ADL report indicated that an additional capital cost of $362,000 and additional operating cost of $161,000 (for reductive degradation) would result in a 0.9 percent additional cost as a percent of selling price. Thus while the cost of dealing with the contaminated sewers cannot be precisely determined from this record, the order of magnitude does not appear to be such that, when added to the cost of treatment, it will cause a significant economic impact on Velsicol.

26. Velsicol argues that the Agency must file an inflation impact statement ("IIS"). Executive Order 11821 requires that major proposals for legislation and promulgation of regulations and rules by agencies of the executive branch be accompanied by a statement certifying that the inflationary impact of the proposals has been evaluated. The only possible criterion that would trigger the filing of an IIS in this case is a finding that the additional costs of production are more than 5 percent of the selling price.

The costs of the proposed technologies and the number of gallons to be treated are discussed above. There is no reason to believe that the cost of a 300 gpm treatment system using resin adsorption, carbon adsorption or reductive degradation including the additional cost of lining the contaminated sewer lines, would equal or exceed 5 percent of the selling price.

27. NRDC urges that these standards be expanded to cover discharges other than those of manufacturers and formulators, and in particular, discharges into publicly owned treatment works (POTW's).

The Agency knows of no point source discharges of the four substances which are not covered under the regulations with the possible exception of discharges by or into POTW's. Section 307(a)(5) authorizes the Administrator to designate the category or categories of sources to which the proposed toxic pollutant effluent standards will apply, and thus the exclusion of these discharges from the proposed standards is lawful.

Pesticides such as the ones in question here are not amenable to treatment in secondary systems (indeed they may hamper the operation of such systems), and hence the application of these standards to POTW's would be inappropriate. However, this is precisely why, as the legislative history demonstrates, the Agency is authorized to set pretreatment standards for discharges into POTW's under § 307(b) Senate Report 92–414

(92nd Cong., 1st Sess.) states at p. 62 that pretreatment is needed to control toxic substances which would otherwise degrade the capacity of the treatment system to function properly, and to minimize the introduction of compounds which are not removed by conventional treatment methods but offer a potential for incorporation in food chains, such as chlorinated organics and heavy metals.

The Agency is currently developing pretreatment standards covering these toxic substances which will be issued under § 307(b).

28. Velsicol, Hercules and others argue that the proposed standards for endrin and toxaphene should not automatically be incorporated into NPDES permits. Section 402(k) provides that compliance with an NPDES permit shall be deemed compliance (for purposes of section 309 and section 505) with section 307, except any standard imposed under § 307 for a toxic pollutant injurious to human health. Section 129.5(c)(2) provides that all toxic pollutants for which standards are set under § 129 are deemed injurious to human health under the regulations. Under § 129.5 (a)–(c) of the proposed regulations limitations based on the proposed standards would be incorporated into existing permits, and such limitations would automatically be subject to revision if the toxic pollutant standards were modified, regardless of the duration of the permit period.

The objection is made that the Administrator is simply "assuming" that these toxic pollutants are injurious to human health when in fact they are not. This is not correct. Section 129.5(c)(2) is intended to have, and has, exactly the same effect as if the Administrator had stated in the proposed standards that endrin and toxaphene are injurious to human health. It does not mean that EPA simply assumes that all § 307(a) toxic pollutants are injurious to human health.

Hercules argues that the Agency may not find a toxic pollutant injurious to human health just because it would be injurious if discharged in "any" quantity (meaning an unlimited quantity), but rather that the Administrator must determine whether the substance, in the amounts being discharged by actual dischargers, is injurious to humans. The correct meaning of section 402(k) is neither as broad nor as narrow as these interpretations. Clearly, as Hercules points out, many substances essential to human life would be injurious to human health if ingested in sufficient quantities, and therefore section 402(k) cannot refer to pollutants injurious in "any" quantity. Just as clearly, the Agency does not have to establish that an actual discharge of a particular substance is in fact threatening human health in order to find that that substance is "injurious to human health". The record establishes that endrin and toxaphene are both "injurious to human health" in relatively small quantities, and the FDA has taken action to protect humans from ingestion of both substances. In plain English they are very poisonous to humans. The Agency believes that Congress intended control of the discharge of such substances to be effective as early as possible.

29. No formulator challenged any of the proposed standards, nor was any evidence introduced at the hearing which tended to establish that the standards proposed for endrin or toxaphene formulators could not be complied with. (See discussion of comments on the proposed standards in the Summary of Written Comments below.)

TOXAPHENE

1. Toxaphene (chlorinated camphene) actually consists of a number of chlorinated compounds. Gas chromatographs show it contains 30–40 principal constituents. Toxaphene behaves much like other chlorinated hydrocarbon pesticides in the aquatic environment. It degrades slowly, adsorbs on particulate matter and concentrates in living tissues, especially lipids.

2. As noted in the discussion of endrin above, the laboratory bioassay is widely accepted in the scientific community as a basis for the derivation of water quality criteria and related standards. A 96-hour LC 50 bioassay test is customarily used to determine that concentration of a toxicant which causes death to half the test organisms during a 96-hour period under the test conditions. The data gathered from such tests are customarily used to assess the acute toxicity of a pollutant, as are the data from longer term chronic bioassays. Comparative results using the static and flow-through bioassay demonstrate that, in general, flow-through data yield lower toxicity values for a pollutant than static bioassay data since the concentration of the pollutant in the former tends to remain constant, while in the latter it is gradually reduced due to settling out, adsorption, or consumption by organisms of the pollutant.

3. Phytoplankton and zooplankton constitute the base of the aquatic food chain. The presence of an adequate plankton population can determine the scarcity or abundance of larger, economically valuable predator fish species. In 1962, five species of marine phytoplankton, chosen for their importance as a food source for clam and oyster larvae, were exposed to varying concentrations of toxaphene and other substances. Toxaphene was the most toxic of the chlorinated hydrocarbons tested. Concentrations of 150 μg/l were lethal to all organisms. At 10 μg/l no appreciable effect was seen with four species. One organism, *Monochrysis lutheri*, was killed by a concentration of 0.15 μg/l but not by .015 μg/l. The 96-hour LC 50's of toxaphene in static bioassay tests on several freshwater invertebrates commonly found in U.S. waters are: the stonefly, *Classenia sabulosa* 1.3 μg/l; the stonefly, *Pteronarcella badia* 3.0 μg/l; the stonefly, *Pteronarcys california* 2.3 μg/l.

4. Steven Schimmel, a research aquatic biologist at the EPA Environmental Research Lab in Gulf Breeze, Florida, conducted 96-hour flow-through bioassays on five vertebrate and invertebrate species and 28-day tests on a sixth species. Each species selected is important either economically or as a link in the food chain or both. The species, and their importance and the tests results were:

Species	*96-h LC 50*
Pink shrimp—of considerable commercial importance. One of the principal shrimp marketed for human consumption. Important as food for the speckled trout, white trout, croaker, drum and other species.	1.4 μg/l.
Grass shrimp—an important food chain animal.	4.4 μg/l.
Sheepshead minnow—important in some estuarine food chains; predators of this fish include many inshore commercial fish.	1.1 μg/l.
Pinfish—in many areas the most abundant fish species. A link in the food chain supporting such commercially important species as the spotted seatrout, the sailfish, and the gulf flounder. Also of some importance as bait and for human food.	0.5 μg/l.
Oyster—widely distributed and of commercial importance.	96-h EC 50 16 μg/l (shell deposition reduced 50 percent).
Long-nose killifish—an extremely important food chain organism for a variety of commercial species.	28-d LC 50 for fry, juvenile or adult stages 0.9 to 1.4 μg/l.

5. Toxaphene is acutely toxic to a range of important freshwater fish at extremely low concentrations, as shown below:

Species	*96-h LC 50 (μg/l)*
Largemouth bass	2.0
Brown trout	3.0
Bluegill	3.5
Carp	4.0
Black bullhead	5.0
Goldfish	5.6
Coho salmon	8.0
Rainbow trout	11.0
Yellow perch	12.0
Channel catfish	13.0
Redear sunfish	13.0
Goldfish	14.0
Fathead minnow (hard water)	5.1
Fathead minnow (soft water)	7.5
Guppies (soft water)	20.0
Chinook salmon	2.5
Coho salmon	9.4
Rainbow trout	8.4
Rainbow trout (53° F)	---
Stonerollers (53° F)	14.0
(73° F)	5.0
Goldfish (53° F)	94.0
(73° F)	50.0
Golden shiner (73° F)	6.0
Bluntnose minnow (53° F)	30.0
(73° F)	6.3
Black bullhead (53° F)	25.0
(73° F)	1.8

6. Dr. Foster Mayer, Chief Biologist of the Fish and Wildlife Services Fish Pesticide Laboratory, U.S. Department of the Interior, testified that substantial differences in susceptibility to toxaphene may occur depending on the life stage of the organism tested. In static bioassays performed on three life stages of the channel catfish, newly hatched fry (before yolk adsorption) were extremely

resistant to toxaphene poisoning, while swim-up fry had a 96-hour LC 50 of 0.8 μg/l.

Daphnids, a freshwater invertebrate species, were continuously exposed to varying toxaphene concentrations during a complete life cycle in a flow-through system. Toxaphene concentrations of 0.12, 0.28, 0.54 and 1.0 μg/l significantly reduced the number of young daphnids produced. While after 14 days there appeared to be no effect on the production of young in the 0.07 μg/l concentration, after 21 days there was a 9% reduction in the total offspring produced.

In a recent study conducted by Dr. Mayer, yearling brook trout were continuously exposed in flow-through bioassays to toxaphene concentrations of 0.039, 0.068, 0.139, 0.288, and 0.502 μg/l for as long as 6 months. Growth of the trout exposed for 6 months to 0.288 and 0.502 μg/l was significantly reduced. The additional stress of physiological changes occuring before and during spawning caused a 50 percent mortality in the 0.288 μg/l concentration and a 100 percent mortality in the 0.502 μg/l concentration. There was 8 percent mortality in the 0.039, 0.068, and 0.139 μg/l concentrations. Concentrations of 0.068 μg/l and higher significantly reduced egg viability. Growth of the fry, as measured by length, was significantly reduced after 30 days of exposure in the 0.139 and 0.288 μg/l concentrations. All fry in the 0.052 μg/l treatments were dead in 30 days. After 60 days of exposure and thereafter, growth was significantly reduced in all groups of fish exposed to toxaphene. Finally all levels of toxaphene tested caused a significant increase in the ratio of calcium and phosphorus to collagen in the backbone of brook trout fry during a 90-day exposure. The data developed by Dr. Mayer in this research do not establish a chronic no-effect exposure level for toxaphene, but do show that such number is less than 0.039 μg/l in a 90-day exposure.

In other tests done by Dr. Mayer, emergence of midges (a freshwater invertebrate species) was significantly reduced after exposure to toxaphene concentrations of 3.2, 5.6, 10 and 32 μg/l, during a flow-through life cycle bioassay. Another invertebrate, the scud, was exposed to toxaphene for 30 days. Growth (as measured by length) was significantly reduced in the 0.25, 0.50 and 1 μg/l concentrations.

In further tests conducted by Dr. Mayer and his colleagues at the Fish-Pesticide Research Lab, one-week old fathead minnows continuously exposed in a flow-through system for 150 days to 0.094, 0.205, 0.399, and 0.727 μg/l toxaphene exhibited chronic adverse effects at every concentration level tested. Collagen content of the backbone was significantly decreased by toxaphene, and calcium control was significantly increased. The calcium and phosphorus/collagen ratio was 0.50 in the backbones of control fish, whereas it was 0.69, 1.2, 1.2, and 1.2 in the fish exposed to 0.094, 0.205, 0.399 and 0.727 μg/l toxaphene, respectively. All concentrations of toxaphene tested significantly decreased fish growth.

Because toxaphene caused a decrease in the collagen content of the backbone and an increase in calcium, Dr. Mayer believed that the backbone of the exposed fish might be dangerously fragile, and therefore less tolerant to stress. To verify this belief, six fish which had been exposed to concentrations of 0.094, 0.205, 0.399 and 0.727 μg/l toxaphene were subjected to an electrical shock. The backbones of the six control fish were unaffected by the test. The backbones of four fish from each of the four concentrations tested were broken in several locations, thereby confirming toxaphene's role in increasing the fragility of the backbone.

Dr. Mayer subsequently tested 30-day old fathead minnows in a second flow-through bioassay lasting 295 days. He testified that fry growth was reduced at 0.054 μg/l toxaphene, thus indicating that the chronic no-effect level is below 0.054 μg/l.

7. The toxicity of toxaphene has been determined for a number of birds. Acute oral toxicity values (LD 50) are as follows: young pheasants, 40.0 mg/kg; sharp-tailed grouse, 10–20 mg/kg; young mallards, 70.7 mg/kg; young bobtail quail, 85.4 mg/kg; lesser sandhill cranes, 100.0–316.0 mg/kg; fulvous tree ducks, 99.0 mg/kg.

In a study of pheasants fed 100 and 300 ppm of toxaphene in their diets for 2 to 3 months, the 300 ppm level caused a decrease in egg laying, hatchability, food intake and weight gain. Both dose levels caused greater mortality in young pheasants during the first two weeks after hatching than was observed in the controls.

High mortalities of fish-eating birds were observed at the Tule Lake and Lower Klamath Refuge in 1960, 1961, and 1962. Agricultural applications of toxaphene to surrounding farmlands were the reported cause of the extensive deaths. Fish from nearby marshes were found to have body burdens of about 8 ppm toxaphene. Toxaphene levels as high as 31.5 ppm were found in the fat of fish-eating birds.

8. Acute oral toxicity levels for various mammalian species are as follows:

Species	Route	LD 50 (milligrams per kilogram)	Vehicle [1]
Rat	Oral	90	Peanut oil.
Rat	do	60	Corn oil.
Rat	do	120	Kerosene.
Mouse	do	112	Corn oil.
Dog	do	40	Do.
Do	do	250	Kerosene.
Guinea pig	do	270	Corn oil.
Do	do	365	Kerosene.
Cat	do	25–40	Peanut oil.
Rabbit	do	75–100	Do.
Do	do	250–500	Kerosene.
Cattle	do	144	Grain.
Goat	do	200	Xylene.
Sheep	do	200	Do.
Rat	Dermal	930	Do.
Rabbit	do	4,000	Dust.
Do	do	250	Peanut oil.

[1] The vehicle used to apply a toxicant may influence the rate and extent of toxicant adsorption by the animal, whether by oral or dermal or other mode of application. Furthermore, some vehicles may themselves be significantly toxic.

9. In humans acutely toxic doses of toxaphene produce symptoms including salivation, leg and back muscle spasms, nausea, vomiting, hyperexcitability, tremors, convulsions and tetanic contractions of skeletal muscles. Diffuse stimulation of the cerebrospinal axis is the cause of most of these effects. After lethal doses, the convulsions continue until death occurs. However, acute toxaphene poisoning in humans is rare. When toxaphene was first used, four cases of poisoning by ingestion of four children under 4 years of age were reported. The same report contained a description of severe toxaphene poisoning in adults from accidental ingestion or injudicious use. Doses in three of these cases were estimated at 9.5 to 47 mg/kg.

10. There is some data available on the question of whether toxaphene is carcinogenic. As discussed above with respect to endrin, NCI tested toxaphene with rats and mice, but the NCI data on toxaphene are still unverified and NCI has not yet completed its analysis of the data. Dr. Reuber examined the NCI studies on rats and mice and concluded that both demonstrated that toxaphene is carcinogenic in rats and mice. Also, studies performed in 1969 with strobane, a chemical closely related to toxaphene, produced an increased incidence of lymphomas and hepatomas in the mice fed that chemical. None of this data has yet been reviewed under the Agency's Interim Policy.

For the reasons stated above with respect to endrin, because of the preliminary nature of this information, and the lack of any record evidence on what, if any, cancer risk may exist for man in light of such data, or the significance of the data in etstablishing an ambient water criterion, the Agency believes it provides an insufficient basis for modifying the proposed criterion or the toxic pollutant effluent standards for toxaphene. However, the existence of these data underscores the Agency's concern that discharges of toxaphene be minimized.

11. Like other chlorinated hydrocarbon pesticides, toxaphene is a persistent chemical and a long-lived environmental contaminant. It has a low solubility in water (about 0.5 ppm).

Pesticide movement through or across soil is facilitated by the movement of water. Overland flow is generally more important in pesticide transport than passage through soil. Two processes are involved: pesticide movement while dissolved in water and pesticide movement while adsorbed on soil. Following adsorption onto particulate matter and bottom sediments, toxaphene will remain undegraded and available to aquatic organisms for an as yet undetermined number of years.

Toxaphene has been reported to persist in soil for periods ranging from several months to more than 10 years. An experimental halflife of 4 years, similar to that of DDT, has been calculated for toxaphene. After release into lakes and ponds, toxaphene has been shown to persist for as long as 9 years.

There is little evidence concerning the extent to which toxaphene may degrade or detoxify in the environment. To the extent that rapid detoxification does occur, there is some evidence that it consists of the adsorption of toxaphene onto sediments, rather than any extensive chemical degradation of the toxaphene itself.

Dr. Leonard Guarraia testified that the data he had seen show that toxaphene accumulates in bottom sediments; that the toxaphene present in the sediments is available to harm bottom organisms even if buried beneath the surface; that any manmade or natural disturbance of bottom sediments, such as might result from dredging or from storms, would stir up the toxaphene and make it available again to the water column; and that such disturbances might release toxaphene from the sediments.

12. Bioaccumulation of toxaphene has been shown to occur in a number of freshwater and marine species. Since toxaphene has been shown to persist in the aquatic environment for years, bioaccumulation poses a latent and continuing threat to aquatic life of commercial and recreational importance. Bioaccumulation by such widespread organisms as oysters, trout, and catfish, all of which are consumed my man, carries the threat of toxic effects directly to man, for man has the capacity to store and accumulate compounds such as toxaphene in his tissues.

Experiments to determine the ability of a number of freshwater species to bioaccumulate toxaphene were conducted by Dr. Foster L. Mayer of the Fish-Pesticide Laboratory. In studies mentioned previously, yearling brook trout concentrated toxaphene by a factor of 16,000 and 5,000, respectively, at exposure levels of 0:502 μg/l and 0.039 μg/l. After 161 days, whole body residues of toxaphene in fish exposed to 0.288 and 0.502 μg/l toxahene were 2.4 and 8.9 μg/g, respectively. (Such high body concentrations pose a serious latent danger to the survival of these fish, since extensive mortality was experienced by fish exposed to these levels of toxaphene just prior to and during spawning.)

Brook trout from all toxaphene exposures (0.039, 0.068, 0.139, 0.228, 0.502 μg/l) were analyzed for the distribution of toxaphene residues between the fillet and the remaining tissue (offal) after 161 days. Toxaphene residues in the offal were 2.8 to 4.2 times that found in the fillet. The highest residue detected in the fillets was 4.9 μg/g, whereas residues in offal were 13 μg/g. (The FDA seizure level for toxaphene in fish to be consumed by man is 5 μg/g.) The highest concentration factor in the brook trout was found in the fry, which concentrated toxaphene up to 76,000 times the level in the water in only 15 days.

Toxaphene residues in fathead minnows after 150 days of exposure to 0.094, 0.0205, 0.399 and 0.727 μg/l of toxaphene were 5.9, 13, 22 and 52 μg/g, respectively. These residues represent accumulation factors of 55,000 to 70,000.

Adult channel catfish accumulated toxaphene from water after 100 days of exposure by factors of 17,000 to 26,000. Fry accumulated toxaphene in amounts ranging from 27,000 to 50,000 times that in the water.

After a 7-day exposure to a concentration of 0.125 μg/l and 0.062 μg/l, daphnids concentrated toxaphene to 4,000 times the water concentrations.

13. Tests to determine the bioconcentration phenomenon in marine species were conducted by Steven Schimmel at the Gulf Breeze Laboratory in Florida. His tests showed that toxaphene accumulated in whole body tissues of the longnose killifish by factors ranging from 4,200 to 60,000 times the water concentration in a 28-day period; concentration in ova ranged from 1,000 to 5,000. In 96-hour bioconcentration studies, concentration factors ranged from 3,100 to 20,600 in the sheepshead minnow; 9,000 to 15,200 in oysters; 400 to 800 in grass shrimp; and 800 to 1200 in pink shrimp. Pinfish concentrated toxaphene 3,800 times the amount present in the water.

14. A number of field studies have verified the conclusion drawn from laboratory tests that toxaphene bioaccumulates after its release into the environment. In a study conducted at Davis Lake, Oregon during 1961–1963 the following bioconcentration ratios between organism tissue and water concentration were observed: 500 for aquatic plants; 1,000 to 2,000 for aquatic invertebrates; 10,000 to 20,000 for rainbow trout; 4,000 to 8,000 for Atlantic salmon; and 1,000 to 2,000 in 1961, for lake bottom and mud. In that study toxaphene was applied to the lake at 88 mg/l and was found in 1962–3 to be present at levels of 2.1 and 1.2 μg/l, respectively.

In a study using marine organisms it was demonstrated that an accumulation of as much as 30 ppm took place in oysters exposed for 24 weeks to 1 ppb of toxaphene—a concentration factor of 30,000. In the ensuing 16 weeks in clean seawater the oysters excreted 90 percent of this load, but retained 3.0 ppm in their tissues—still 3,000 times the water concentration they had been exposed to originally. The oyster is a species used for human food and is of commercial importance.

In the estuarine waters of the United States, toxaphene residues as high as 15 μg/l were discovered in the ova of spotted seatrout, a commercial sport fish from coastal Texas. Dr. Robert Reimold, a witness for Hercules, has documented high toxaphene concentrations in a number of animals, including oysters, shrimp and anchovies, in the Georgia estuary surrounding Hercules' manufacturing plant.

15. The Estuarine Monitoring Program, directed by Dr. Philip A. Butler of the Gulf Breeze Environmental Research Laboratory in Florida, demonstrated that shellfish can bioconcentrate pesticides up to 70,000 times the ambient water level. Of the 664 samples taken in Georgia, 128 contained toxaphene, the maximum residue being 54,000 ppb. According to Dr. Butler, the large number of Georgia samples containing toxaphene reflects the direct contamination of the marine environment by the effluent from Hercules' plant. Dr. Butler personally reported to Mr. Schimmel that he found no toxaphene residues in samples taken from stations off the coast of Georgia this year. Mr. Schimmel testified that caution must be exercised in comparing these results to those of earlier years, since very few samples had been analyzed this year, and further, those analyzed included only migratory fish species.

16. A limited amount of information is available on the emergence of strains of species which have developed a resistance to toxaphene. The approximate 36-hour LC 50 for mosquitofish from five sites on the Mississippi River ranged from 10 to 30 μg/l. A resistant population of mosquitofish had a 36-hour LC 50 as high as 480 μg/l. It would be possible for such resistant fish to bioaccumulate toxaphene and transfer it directly to predators, including man.

17. The data cited above establish that toxaphene is highly toxic to a number of important and commercially valuable organisms, including invertebrates and vertebrates.

Toxaphene may persist in the aquatic environment, the soil and animal tissues for long periods of time, and is capable of bioaccumulation by factors of as much as 76,000 in freshwater fish and 60,000 in marine fish. Concentrations of toxaphene as low as 0.039 μg/l for 60 days will produce decreased growth and/or weakened backbones in the brook trout, and levels as low as 0.094 and 0.054 μg/l will within 150 days produce the same results in the fathead minnow.

18. The use of general application factors to estimate safe concentrations of toxicants in aquatic environments to protect against chronic exposure when experimental chronic toxicity data are lacking is a recognized and sound scientific procedure.

The application factor of 0.01, discussed above in connection with the ambient water criterion for endrin, is recommended by the National Academy of Sciences for organo-chlorine pesticides such as toxaphene. It is applied to the 96-hour LC 50 of the most sensitive species sought to be protected, in order to provide protection against adverse effects from chronic exposure.

Since reliable data had been developed only on a small number of organisms, it is reasonable to rely on data from the most sensitive animal tested. In relying on the most sensitive animal tested and increasing its protection by the safety margin inherent in the use of an application factor of .01, the Agency has sought to provide protection for even more sensitive organisms, which may exist but have not been studied.

The Agency proposed an ambient water criterion for toxaphene of 0.005 μg/l. This is based upon an application

factor of 0.01 applied to the 96-hour LC 50 (0.5 μg/l) of the pinfish, which was the most sensitive species tested. However, the Agency in setting the ambient water criterion considered all the available data. Many fresh and saltwater organisms have 96-hour LC 50 values at or near 1 μg/l. Critical 96-hour LC 50 or comparable data include:

1.3 μg/l, stonefly; 1.1 μg/l, sheepshead minnow; 1.8 μg/l, black bullhead; 1.4 μg/l, pink shrimp; 1.0 μg/l, spot (48 hour); 0.5 μg/l, spot (144 hour).

Although all these test organisms may not be universally distributed in the waters of the United States, they represent types of organisms present in fresh, marine and estuarine water bodies throughout the country. (The pinfish has been found in the Brunswick Estuary, into a portion of which Hercules' plant discharges, and in the nearby Duplin Estuary.) Thus, while available data may not represent either the most sensitive or most important sensitive organism at a given geographical location, the data are indicative of predictable toxicological effects in the aquatic environment. Many of the species tested are of demonstrated commercial or food chain value, and additionally many are valuable as a recreational resource.

EDF argued that the application factor used by the Agency is underprotective, asserting that the no-effect level for the fathead minnow is 0.025 μg/l. Actually the no-effect level for the fathead minnow is not known, but the lowest observed effect level is 0.054. EDF next asserts that the 96-hour LC 50 for this species is 7.2 μg/l—a number which appears nowhere in the record. In the Criteria Document the 96-hour LC 50 for fathead minnows is 7.5 μg/l for soft water, and 5.1 μg/l for hard water. The latter number is the value generally used, and was used by EDF in examining EPA's witness Dr. Guarraia. As Dr. Guarraia testified, the best available data on this species confirm a 1 percent, or .01 application factor.

Dr. Mayer's brook trout study, also cited by EDF and discussed above, does indicate chronic effects at less than 1 percent of the 96-hour LC 50. However, the ambient water criterion of 0.005 μg/l established by the Agency is in fact well below the lowest chronic effects level for the brook trout (0.039 μg/l) and is below the lowest effect level for the fathead minnow by a factor of more than ten times.

Dr. Guarraia testified that in deriving the .005 μg/l ambient water criterion level, he relied on the National Academy of Sciences 1972 recommendation of an application factor of 0.01 applied to the 96-hour LC 50 of the most sensitive species tested. He stated that based on the information and material set forth in the crtieria document, the ambient water criterion of 0.005 μg/l could provide an ample margin of safety for aquatic life and for the consumers of aquatic life.

Mr. Schimmel also testified in support of an application factor of 0.01 for toxaphene and stated that based on the knowledge and information available to him the ambient water criterion of 0.005 μg/l should be protective of marine aquatic systems.

19. At the hearing, witnesses for Hercules, namely Drs. Robert J. Reimold and B. J. Copeland, testified concerning a comparison made by Dr. Reimold of the species diversity indices for the Brunswick Estuary, including Terry Creek (into which Hercules discharges its toxaphene-contaminated wastewater), and the nearby Duplin Estuary, which is similar in many respects but into which there is no discharge of toxaphene. Dr. Reimold is an estuarine ecologist, and Dr. Copeland is a professor of zoology, botany and marine sciences. Based upon this comparison of the species diversity indices over a five-year period, Hercules contends that their discharges are having no adverse effects on any organisms in the receiving waters and therefore the Agency's proposed standards are overly restrictive.

The Agency believes that there are very serious scientific objections to the use of species diversity indices, that they have numerous inherent limitations and shortcomings and that they have limited value unless basic hypotheses about diversity and community structure are demonstrated independently for the case at hand. While Hercules tries to suggest that the National Academy of Sciences endorses the use of species diversity indices for use in setting ambient water criteria, in fact the contrary is true: for pesticides the NAS recommends precisely the method used by the Agency, namely use of application factors applied to the 96-hour LC 50 for the most sensitive species tested. NAS recommends use of diversity studies for pollutants which physically change the environment in an integrative manner, e.g., turbidity, alkalinity, color; these pollutants often do not damage species, but change the environment to cause species to avoid the areas. NAS does not recommend use of diversity studies for pesticides and other chemical toxicants.

A species diversity index is a mathematical formula which is a function of the distribution of the numbers of individuals among various categories or species; there are several types of species diversity indices but many of them are simply mathematical variations of a common formula. A species diversity index may be applied to any number or kind of objects, e.g., people in buildings or telephone codes. The species diversity index reflects the distribution of individuals within the categories. The index number is highest when the number of individuals in a sample is equally distributed among the various categories, or species; it is lowest when the distribution is skewed, i.e., there are many more individuals in some categories, or species, than in others. In other words, if you killed 10 percent of the organisms in each species this would not affect the species diversity index at all. (Such a kill could occur with nonselective toxicants. Available bioassay data suggest that toxaphene may be non-selective since the LC 50's are in the same numerical range for many species tested.)

The relationship between diversity and stability, or ecological health, if there is any such relationship at all, is not well understood, as conceded by Dr. Reimold. The use and validity of species diversity index data is a matter of considerable debate and difference of opinion within the scientific community. In fact, no theoretical relationship has been established between a diversity index and the health of a system. A diverse system may be healthy or unhealthy.

While the species diversity index allows a numerical comparison of systems in terms of the evenness of distribution of individuals among species, one cannot tell from the index alone whether or not the system is stable or unstable, healthy or unhealthy. A system with a high diversity index may not in fact be healthy.

There are many things that species diversity does not reflect which are important and useful in assessing the health and comparability of ecosystems under examination. In the case of Reimold's work, the comparability of impacted and non-impacted areas, as to health or physical, chemical and biological similarity, is questionable and cannot be determined from species diversity indices alone. Species diversity indices do not indicate what, if any, organisms are suffering chronic adverse effects or are under stress from a pollutant. Similarly, they do not reveal anything with respect to bioaccumulation of a pollutant by organisms. They do not indicate whether one or more additional species would be present but for a particular toxic pollutant. The species diversity index number does not tell you the number of species present in the ecosystem or in the samples taken, or how long the species taken in the samples have been in that location. Species diversity index data disclose nothing with respect to the importance of the various species; one must look to the identity and numbers of the species to draw any conclusions in this regard.

In fact one can tell very little by the species diversity indices or a comparison of the indices. As the Hercules witnesses conceded, each system differs to some extent despite what may be a similarity in species diversity index numbers. In order to tell anything about the health of an ecosystem, one must look to the species themselves, and their condition. The actual comparison of the number of species and individuals reported for each of the five years in Dr. Reimold's study, which Dr. Reimold agreed should be examined in order to learn what is actually going on in the ecosystem, strongly suggests that Hercules' discharges of toxaphene into Terry Creek throughout the entire five-year period continuing up to the present time have had a definite adverse

impact on the ecosystem, resulting in far fewer species in Terry Creek than in the comparable Duplin Estuary or even in the remaining portions of the Brunswick Estuary.

Dr. Reimold's samples show the following:

Year	Terry Creek	All Brunswick Estuary sites	Duplin Estuary
Species:			
1970–71	3	37	65
1971–72	13	40	50
1972–73	17	39	41
1973–74	21	35	33
1974–75	14	33	36
1975–76	9	24	13
Individuals:			
1970–71	176	1,914	59,113
1971–72	490	4,439	30,263
1972–73	896	4,644	5,247
1973–74	323	1,332	2,658
1974–75	214	1,996	3,201

For 1972–73 data, the H-bar species diversity indices for Terry Creek and the Duplin Estuary were 1.72 and 1.80, and for 1973–74 they were 2.25 and 1.99 respectively, despite the substantially greater number of species and individuals in the Duplin Estuary in each instance. As Dr. Reimold himself testified, this type of data bears out that one cannot tell the health of a system by comparing index numbers, but one must go to the real world and see what species and what organisms are in fact present in the ecosystem.

For each of the periods discussed above (except 1975–76) Dr. Reimold conceded that one of the reasons why the number of species in Terry Creek was so much lower than it was for the Duplin Estuary or the remaining portions of the Brunswick Estuary was that Hercules' toxaphene discharges were having a definite adverse impact on the ecosystem. (For the period 1975–1976 Dr. Reimold expressed doubt that this was the case.)

Another difficulty with Dr. Reimold's study was that it did not analyze the whole ecosystem. Dr. Copeland, Hercules' witness, testified that in developing water quality standards or in considering the effect of something in the system, one should consider the system as a whole. As an example of what Dr. Copeland meant, in the several studies which he conducted in Galveston Bay, he sampled and studied all of the different categories of species, including phytoplankton, zooplankton, nekton (free-swimming organisms), and benthic orgahisms (those which live on the bottom), and he also examined the water quality itself.

Dr. Reimold in contrast did not make an analysis of the whole system; he studied and compared only the nektonic organisms in the Duplin Estuary, Terry Creek, and Brunswick Estuary. He did not sample and examine zooplankton or phytoplankton. Nor did he examine benthic organisms even though it is well known that toxaphene tends to settle in sediments, to which benthic organisms are directly exposed, and even though Dr. Reimold was aware in 1969 (prior to the commencement of his studies) that there was toxaphene in the sediments of Terry Creek at concentration levels in excess of 4,000 parts per million (ppm).

Because there are often high fluctuations in the species and numbers of individuals in "control" bodies of water, and fluctuations in species and numbers of individuals in both the control and the test body of water which are undoubtedly due to factors other than pollution levels, it is very difficult if not impossible to make meaningful comparisons of the effects of pollution by use of species diversity data, given the large number of unascertainable variables.

For the same reason, Dr. Reimold conceded, it is hard to establish cause and effect relationships, and in order to draw conclusions one would have to get results which exceed these substantial variations. Because of these substantial natural variations, it is extremely difficult if not impossible to draw any reliable conclusions from a comparison of ecosystems (even apart from all of the inherent limitations of species diversity data set forth previously) when the ecosystems themselves are very different to begin with. The data indicate that Terry Creek and the Duplin Estuary are very different. Thus for example in the statistical analyses performed in Dr. Reimold's 5th Annual Report for all five of the years covered, based upon the number of individuals in the samples, in 190 comparisons made all but 22 showed statistically significant differences; in a similar statistical analysis based upon biomass, of the 190 comparisons made, all but 10 showed statistically significant differences. These data indicate that the two systems are not comparable.

In addition, Dr. Reimold's sampling methods were seriously deficient. To analyze an entire ecosystem, one should use whatever nets and other equipment and devices are necessary to get all the different types of species. It is important to collect everything possible because, despite random selection of sampling areas or times, organisms are not randomly distributed. Livingston, in a well-respected study of kraft pulp mill effluents in Appalachee Bay, Florida, used numerous techniques to assure collection. Sampling was carried out with dipnets, seines, gill and trammelnets, otter trawls, and hook and line. Some stations were blocked off with seines and poisoned with rotenone. Larger predators and game fishes not sampled by otter trawls were also followed by examination of catches made by sport fishermen at a local fish camp and commercial fishing interests in the area. Livingston used rarefaction procedures to correct differences in trawl sizes and trawl times. (It is interesting that at the end of his study Livingston questioned the validity of the various diversity indices he used as indices of the "health" of his Florida study area).

Dr. Reimold, by contrast, used no rarefaction procedures and used only otter trawls. This type of net is inadequate to collect all species of nekton.

Furthermore, replication of sampling is important as a check on what is being collected, methods used, and reproducibility of suspect results. Reimold did not do duplicate sampling each time in each location even though in a number of instances he collected no organisms whatsoever in his trawl runs. Without replicate samples it is impossible to know whether the area was defaunated or whether he was just collecting samples in the wrong places.

As Dr. Reimold testified, use of several net sizes and inclusion of day and night samples might well produce great differences in the number of individuals and species. This could significantly affect the results, as Dr. Reimold conceded. Dr. Reimold's explanation was that "it was just not one of those variables we had sorted through for." During the hearing it was revealed that though not disclosed in his statement of "methods" in his 5th Annual Report, during the period 1970–73 Dr. Reimold used two different sizes of otter trawl nets in the Duplin Estuary, though not in Terry Creek apparently. He also stated that for the first three years of his sampling he included night samples as well as day samples in the samples taken from the Duplin Estuary and later changed his testimony to state that he had included such samples in the Duplin data through June 1975. Dr. Copeland testified that you usually get 20–25 percent more organisms by night than by day. The Livingston study referred to above collected as much as 50 percent more at night. (Neither of these points was included in Dr. Reimold's methodology section, contrary to sound scientific practice.) These inadequacies in sampling methods make it impossible to draw valid conclusions from the data generated.

As indicated above, some organisms are more affected by toxaphene at one life stage than another. Dr. Reimold to date has produced no data on age or size of fish, though he conceded that these data are important. Dr. Reimold has never measured water concentrations or studied pollutant concentrations in the field to compare their effects on aquatic organisms with the effects demonstrated in laboratory tests.

Finally, Dr. Reimold's study contained errors of nomenclature (misidentification of species) and figures, which casts doubt both on the validity of the report and its conclusions. As one example of the errors in figures, his Table 10 shows no grass shrimp caught for the years 1970–71, 1971–72, and 1972–73, while his Table 11 gives biomass of 4 grams, 16 grams and 2 grams for grass shrimp in those periods. The errors were such that the report did not engender confidence.

20. As in the case of endrin, following its discharge from a point source an effluent containing a pollutant such as toxaphene typically becomes dispersed and greatly diluted. The area of dilution is referred to as a "mixing zone;" it will vary in size and shape from one body of water to another. It is reasonable to expect dispersion and dilution of a pollutant such as toxaphene in a ratio of 300:1 or more following its discharges

into more receiving waters. As discussed above for endrin, dischargers can take various steps to enhance dispersion and dilution.

It is reasonable to expect that an effluent standard of not to exceed 1.5 μg/l (average per day calculated over any one month) or 7.5 μg/l (maximum in a sample(s) for any working day), after dispersion and dilution in a reasonable mixing zone, will in most instances achieve an ambient water criterion of 0.005 μg/l.

Because of the natural variations in the receiving water hydrology and hydrography, the actual boundaries of mixing zones can best be set and the optimum location for a discharge pipe established on a site-specific basis. More stringent effluent concentrations to provide an ample margin of safety for aquatic organisms and other organisms (including man) can be provided for under § 129.7 of the proposed regulations where needed at a particular site.

There is no reason to believe that any significant environmental harm will result from allowing an occasional excursion up to 5 times the average daily concentration of 1.5 μg/l, so long as the daily average (calculated over any reasonable period, such as a calendar month) is not exceeded.

21. The Agency's proposed mass emission standard of 0.00001 kg/kkg of toxaphene produced for existing manufacturers was calculated by dividing the average daily mass emission (at the plant of the largest manufacturer of toxaphene both in terms of production volume and wastewater volume) by the estimated average daily production. The average daily mass emission was calculated by multiplying the existing flow at Hercules' plant by the average concentration specified in the standards and applying a conversion factor to yield kg/day. The average daily production was determined by dividing the maximum estimated annual production (in kg) by the number of operating days per year.

The average wastewater flow volume from the Hercules toxaphene plant is 167 gpm, or .24 million gallons per day (MGD). This data was used by the Agency in computing its proposed mass emission standard.

Although Hercules declined to furnish its precise production levels of toxaphene, it offered no evidence to contradict those presented by EPA and relied upon in computing its proposed mass emission standard. The production figure utilized by EPA was 50–80 million lbs. of toxaphene per year.

Although Hercules offered evidence that its final discharge volume is 15–20 MGD with a toxaphene concentration of between 5 and 10 micrograms per liter on the average, the evidence discloses that this is not the discharge from the toxaphene plant, but is a discharge to Terry Creek after dilution with approximately 15–20 MGD of cooling water.

No compelling evidence or justification was presented at the hearing to warrant a modification of the proposed mass emission standard so as to allow Hercules credit for its dilution of the wastewaters from its toxaphene manufacturing plant and thereby allow it to discharge mass amounts of toxaphene on a daily basis in excess of the levels proposed by the Agency.

However, Hercules' objection that the mass emission standard would be difficult to meet even if the concentration standard were met has prompted the Agency to reconsider the calculation of this number. The calculation in the proposed standard was based upon the maximum production level, 80,000,000 lbs. per year, and the average wastewater flow volume of .24 MGD.

As stated in the preamble portion of the Notice of Proposed Rulemaking, the purpose of the mass emission standards is to prevent a manufacturer from utilizing dilution instead of treatment to achieve compliance with the concentration standard, rather than to impose an additional limitation more stringent than the concentration standard.

If the calculation used to derive the mass emission level in the proposed standard were recomputed using the maximum wastewater volume for any month for which data are available (.30 MGD, average for July 1974), coupled with a production volume figure at the low end of the 50–80 million lbs. per year (i.e., 50 million lbs. per year) the mass emission level for existing sources would be .00003 kg/kkg.[2]

Using the same figures and the concentration level for new source performance standards yields a mass emission standard for new sources of .0000002 k/kkg.[3]

Evidence was presented at the hearing (as discussed above with respect to endrin) that if a plant ceases operation the residual amounts of the compound in the plant, including piping, may result in a continued discharge of the compound. Because there would be no production level at that time on which a mass emission level could be based, it would be reasonable to require that, during any calendar month for which the toxaphene manufacturing plant is shut down, the discharger must comply with a mass emission standard under which the production volume used is the average production level for the most recent 360 days of operation of the toxaphene plant (which approximates an operating year.)

22. MRI, as part of the scope of the work described previously in connection with endrin, prepared and submitted a report entitled "Wastewater Treatment Technology, Documentation for Toxaphene Manufacture." The MRI study considered data gathered from all four of the manufacturers (Hercules, Inc., Tenneco Chemicals, Inc., Riverside Chemical Co. and Vicksburg Chemical Co.). MRI considered information from each of these four plants, and all four were visited. Of these four manufacturers, only one filed an objection to the Agency's proposed standards for toxaphene, namely Hercules. (Vicksburg Chemical Company filed comments which are discussed in the Summary of Written Comments.)

The technologies which MRI examined for toxaphene, and believed to be the most feasible, were the same as those selected for endrin and discussed above, namely: reductive degradation, resin adsorption, reductive degradation and resin adsorption in series, and carbon adsorption. Similarly, the expert testimony of Dr. Keith Sweeny concerning reductive degradation, and of Joseph L. Rizzo concerning the feasibility of carbon adsorption, as described above in connection with endrin, is also applicable generally to toxaphene wastes with only minor modification.

Endrin and toxaphene are similar in both physical and chemical properties which are important to the phenomenon of adsorption, such as polarity; both are hydrophobic and both are only slightly soluble in water. The chemical natures of the two pesticides are also similar; both are highly chlorinated products containing over 56 percent chlorine by weight. Both compounds can be expected to behave similarly in many chemical reactions, such as oxidation or reduction, and in fact both have been shown to be resistant to oxidation and susceptible to reductive degradation reaction.

MRI utilized essentially the same data base for toxaphene as it did for endrin in arriving at its conclusions that each of the treatment systems mentioned would be feasible. However, while there is excellent laboratory data for each of these technologies, including reductive degradation tests run by Envirogenics on wastewater from Hercules' toxaphene plant, there has not yet been constructed a pilot plant operation for a toxaphene manufacturer, as there has been in the case of the endrin manufacturer, Velsicol.

Hercules presented the testimony of Lawler, Matuskey & Skelly Engineers to the effect that "there is no established treatment technology" (emphasis added) which Hercules can utilize for complying with the proposed standards and that it is not feasible to achieve operation of a treatment facility within one year after promulgation of the proposed standards. As in the case of endrin, the difficulty with the objections made by the manufacturer (Hercules) is that they

[2] The actual calculation is as follows: Daily volume (.30 MGD) × maximum permissible toxaphene concentration expressed in parts per million (.0015 ppm) × conversion factor for gallons to pounds (8.33) = pounds of toxaphene per day in discharge (.00375). 50,000,000 pounds per year production divided by 365 days per year = 137 thousand pounds per day. .00375 pounds per day in discharge divided by 137 thousand pounds per day production = .00003 pounds discharge per thousand pounds of production or .00003 kg/kkg of production.

[3] The new source mass emission standard bears the same ratio to the existing source mass emission standard as respective concentration standards. Hence .00003 × 1/1.5 = .000002 kg/kkg.

are premised on the assumption that the Agency may not promulgate a standard unless there is proof, in the form of experience with actual treatment plants (or at least pilot plants) treating similar industrial wastes, that within one year a given technology can be installed and routinely achieve the standard without upsets or malfunctions. As discussed elsewhere in this decision the Agency does not agree.

23. The design flow for a treatment system utilizing the resin adsorption technology would involve neutralization and sedimentation, followed by filtration with a filter backwash (sludge removed would be incinerated or land filled) followed by the XAD-4 resin adsorption process. For both resin adsorption and reductive degradation, destruction of free chlorine is desirable. This can be done by exposure to sunlight for eight hours or by addition of sodium sulfite. (Removal of the chlorine prevents the discharge of copper in the effluent from a reductive degradation system.)

24. The design flow diagram for a reductive degradation system is essentially the same as for resin adsorption. The design flow diagram for the two processes in series would begin with sedimentation, followed by filtration with filter backwash, followed by the resin adsorption process, followed in turn by reductive degradation treatment.

With respect to reductive degradation, the MRI report states that this technology can achieve levels below 3 μg/l. Dr. Meiners was asked at the hearings how much below 3 μg/l could be achieved, and he testified that it would achieve less than 1 μg/l, based upon the most recent data received from Dr. Sweeny. Dr. Sweeny testified that toxaphene reduces more easily than endrin based upon his actual laboratory experience with effluent from the Hercules plant, and that one should be able to achieve 0.1 μg/l of toxaphene in the effluent using the reductive degradation technology.

25. The carbon adsorption model system would involve neutralization and sedimentation followed by a filtration process with a filter backwash and sludge disposal. This in turn would be followed by two carbon adsorption units in series, with a third standby adsorption unit available to be switched on line as soon as the toxaphene shows signs of breaking through the first unit or approaching the maximum desired effluent concentration. Spent carbon would be incinerated or thermally reactivated.

The isotherm data for toxaphene indicate that the weight percent pickup by carbon adsorption would be even greater for toxaphene than for endrin at concentrations below 5 μg/l. In its written report MRI estimated that carbon adsorption could achieve concentration levels in the effluent of less than 5μg/l (parts per billion) of toxaphene. At the hearing Dr. Meiners of MRI was asked how far below 5μg/l (5 ppb) could be achieved by carbon. Dr. Meiners replied that using carbon adsorption "it is technically feasible to reduce the toxaphene concentration in water to below one part per billion." Mr. Rizzo of Calgon Corp. also testified that a carbon adsorption system could remove toxaphene from industrial wastewaters to less than 1 μg/l on a regular and consistent basis. These conclusions are borne out by repeated tests with toxaphene yielding laboratory isotherm data reliably showing removal capabilities to levels below 1 μg/l.

Hercules has had only limited experience with carbon. They have a plant at Hattiesburg, Mississippi, which does not produce any chlorinated hydrocarbon pesticides. This plant has a carbon adsorption system with a reactivation facility on site. The plant is not a Calgon installation and is not the modular type of system described by Mr. Rizzo. Hercules' witness, Mr. Charles Dunn, conceded that the failures of the carbon adsorption system were basically mechanical and not a result of failure of the carbon adsorption technology itself.

As noted previously during the discussion of treatment technology for endrin removal, with respect to all of the systems discussed above, any problems with respect to pH, biological fouling, free chlorine, or excessive suspended solids can be readily solved. Calgon has the capability to thermally regenerate spent carbon containing chlorinated hydrocarbons, including toxaphene.

26. In a draft report MRI had at one point expressed the opinion that it might take more than a year and perhaps several years to install treatment systems based upon the technologies described above. Prior to issuance of the report in final form, however, more current information was obtained by EPA from Calgon Corp. with respect to installation time of a carbon adsorption system, from Environgencis Co. with respect to installation time of a reductive degradation system, and from Rohm and Haas with respect to installation time of a resin adsorption system. All of the companies indicated that such systems could be installed in less than one year. After review of this data by MRI and EPA, this portion of the draft was excluded in the final edition.

According to Rohm and Haas, a treatment system based upon resin adsorption would take approximately 42 weeks to deliver a 100 gpm system, and as long as 62 weeks till start-up.

Dr. Sweeny testified that a wastewater treatment system based upon reductive degradation technology with a design capacity of up to three hundred gallons per minute wastewater flow could be designed and installed so as to commence operation within a period of one year or less from date of placement of an order. Dr. Sweeny, who has run tests using actual Hercules effluent, testified that this one-year period included bench scale testing at the laboratory, further testing at the toxaphene manufacturing site, design, installation, and full operation including the working out of any start-up problems. He believes Environgencis would contract to install such a system to achieve 1.5 micrograms per liter of toxaphene in the effluent within the one-year period.

Although it took over 1½ years to install the Velsicol pilot plant, a reductive degradation treatment system to treat toxaphene could be installed and operating within a year, because toxaphene reduces readily, and much of the information and experience which has been gained in the endrin/heptachlor experience will be directly translatable to the toxaphene job. As Dr. Sweeny testified, much has been learned over the past year. In addition, the degradation characteristics of toxaphene are known, and the equipment, needed to assemble the system can be obtained and put together in a period of 90 days. Thus as Dr. Sweeny testified, "I feel very confident that this job could be accomplished well within the year framework that is mentioned."

As noted above in the discussion of treatment technology for endrin, Joseph Rizzo of Calgon Corp. testified extensively on the features and characteristics of wastewater treatment systems based upon carbon adsorption. He testified that based upon his experience, a carbon adsorption system can be designed and constructed within substantially less than one year of placing an order, assuming that an adsorption service is used.

In response to questions from counsel for Hercules, Mr. Rizzo testified that he was authorized on behalf of Calgon to state that Calgon would agree to design and construct an industrial treatment system for a toxaphene manufacturing plant which would consistently achieve a monthly average effluent concentration of toxaphene of 1.5 μg/l and to have it operational within one year from the date of placement of the order.

The timetables suggested by Lawler, Matuskey & Skelly (2½ to 3½ years) are more leisurely timetables based on a conservative approach to designing a treatment facility. There is no question that such an approach would yield a greater degree of confidence in the ultimate treatment level and functioning of the treatment plant and perhaps would permit design of a system at reduced cost, but such an approach is not necessary. With a lesser degree of confidence the technologies can clearly be installed and operational within one year. Carbon adsorption technology, for instance, has in several instances been used on an emergency basis to clean up spills of organochlorine pesticides.

27. In addition to considering the feasibility of these technologies, MRI performed an extensive cost analysis. Although MRI's costs include a pH adjustment tank and sedimentation and filtration, Hercules' witnesses conceded that some of these costs might be reduced or eliminated in view of the fact that Hercules already has pH control, lagoons which are available for sedimentation or settling, separation tanks, pumping equipment, and spill control facilities. In addition, Hercules already has a laboratory and gas chromatographic analysis equipment.

The cost of a toxaphene wastewater treatment system based upon reductive degradation system would not be significantly greater than the cost of a system to treat endrin at Velsicol's plant. There are only two additional features which a system to reduce toxaphene would have. First, there should be a filtration step to remove any sediment (this is already in place at Velsicol); and second, there would be a neutralization step with respect to the active chlorine present in waste such as that coming from Hercules. This would involve chemical or photochemical neutralization, which would add not more than 10 percent to the cost.

Hercules manufactures approximately 120 different products. Its plant is approximately 50 years old. The average waste flow from its toxaphene production plant is 167 gpm, or 0.24 million gallons per day, with an effluent concentration averaging approximately 114 μg/l of toxaphene. This waste flow is diluted with cooling water to produce an eventual discharge of 15 to 20 million gallons per day, which dilutes the toxaphene concentration allegedly to less than 10 μg/l.

A summary of the MRI conclusions with respect to reduction levels achievable and associated costs for each of the four alternative systems (as well as Hercules' existing system), for alternative wastewater flow rates of 200 gpm and 300 gpm, are set forth as follows:

Summary of estimated costs for toxaphene wastewater treatment systems (Hercules plant, Brunswick, Ga.)

	Wastewater flow rate (gallons per minute)	Toxaphene in treated effluent		Installed capital equipment cost	Annual operating cost	Cost per pound of toxaphene product [1]
		Parts per billion	Pounds per day			
Hercules' system	[2] 181	203	0.44	$800,000	$300,000	$0.0060
	[3] 146	58	.10	800,000	300,000	.0060
Resin adsorption	200	1.4	.0034	586,200	324,300	.0065
	300	1.4	.0050	790,400	433,200	.0087
Reductive degradation	200	<3	<.0072	350,700	154,100	.0031
	300	<3	<.0108	433,700	181,800	.0036
Resin adsorption plus reductive degradation	200	.1	.0002	731,600	410,300	.0082
	300	.1	.0004	955,900	537,500	.0108
Activated carbon adsorption:						
30 min contact time	300	<5	<.018	617,000	194,200	.0039
60 min contact time	300	<5	<.018	794,000	232,500	.0047

[1] Based upon an annual production of 50,000,000 lbs of toxaphene.
[2] August 1974. [3] February 1975.

28. As noted above, ADL prepared an economic impact assessment for EPA of the impact of compliance with the proposed toxic pollutant effluent standards for toxaphene. ADL concluded that "since Hercules can meet the proposed standards using reductive degradation or carbon adsorption, the additional cost it would incur is less than $0.0090/kg (treatment cost to selling price ratio equals 1.1 percent). This additional cost would not be judged as being economically impactive to either the company or the community." ADL concluded that for no toxaphene manufacturer would the additional cost exceed 2.1 percent of the selling price.

Hercules' own independently retained engineering experts, Lawler, Matusky & Skelly, concluded from their analysis that the costs, including both capital and operating costs, of compliance by Hercules with EPA's proposed standards would amount to less than 2 percent of the price of their toxaphene product.

The ADL report also concluded with respect to formulators of toxaphene as well as the other three pesticides subject to the proposed standards that "it is very unlikely that any formulators will incur significant costs in implementing treatment to meet the proposed standards."

No credible or substantial evidence was offered at the hearing which would suggest that compliance with the proposed standard would result in a significant economic impact to either the company or the community. Because there is no reason to believe that the standards cannot be achieved there is no reason to consider the economic impact which would result in the unlikely event that one or more toxaphene plants were shut down due to failure to comply with the standards.

29. In the Agency's proposed standards, it was specified that the acceptable analytical method for measuring and monitoring for the presence of any of the four toxic pollutants is the method specified in 40 CFR Part 136, except that under those sections where discharge of the pollutant is prohibited, a one-liter sample size is required to increase the analytical sensitivity. (See subsections (b)(2) and (c)(2) of §§ 129.100–129.103.)

The EPA-approved method for measuring and monitoring for organochlorine pesticides (including aldrin/dieldrin, DDT (DDD, DDE), endrin and toxaphene) in industrial effluents is set forth in a document entitled "Method for Organochlorine Pesticides in Industrial Effluents", and is based upon the use of gas chromatography. By the use of this method aldrin can be detected at 0.001 μg/l, dieldrin and DDE can be detected at 0.001 μg/l, and endrin can be detected at 0.003 μg/l. The usual detection level for endrin is 0.003 to 0.004 μg/l. Toxaphene concentrations in water samples can be reliably detected using gas chromatography at 0.5 μg/l level, and in some cases down to the 0.1 μg/l level.

Although the "Method for Organochlorine Pesticides in Industrial Effluents" document prescribes a sample of 100 milliliters, and although this sample size is adequate for a detection level of 1 μg/l, increasing the sample to 1 liter (which is ten times 100 milliliters) will increase the analytical sensitivity. This will enable the person running the test to detect the pesticide at the levels stated above.

No convincing evidence was introduced at the hearing to contradict the foregoing.

Since enforcement proceedings against dischargers would be based on violation of the applicable discharge limits and not on the ambient criterion itself, the fact that the ambient criterion level is below detectable limits is of no concern in monitoring for compliance with these standards.

30. As noted above in the discussion of endrin, the Agency believes that toxaphene is injurious to human health within the meaning of § 402(k), and that § 129.5 of the Agency's proposed regulations correctly provides for the incorporation of the proposed standard for toxaphene into existing NPDES permits.

31. As noted above in the discussion of endrin, discharges of toxaphene into POTW's are not required to be made subject to the proposed standards. The Agency is currently developing pretreatment standards covering dischargers of toxaphene under § 307(b).

Summary of Written Comments

The principal written comments of a substantive nature, together with the Agency's responses thereto, are summarized below (except to the extent dealt with elsewhere in this decision):

(1) The New York State Department of Environmental Conservation suggested that discharges from areas subject to contamination solely by air fallout should not be excluded as provided in subsection (b)(1)(ii) of §§ 129.100–103, in order to avoid a "loophole" which, in their opinion, would permit effluent concentrations of toxic pollutants to exceed those deemed safe. The State also suggested that this would provide for easier enforcement since the Agency would not have to prove that an effluent containing an excessive concentration was not contaminated by air fallout.

The Agency's authority under § 307(a) is limited to discharges of toxic pollutants from point sources. Insofar as the State's comment relates to nonpoint sources of contaminated storm water, it is properly addressed to the organization developing the relevant areawide waste treatment management plan under § 208 of the Act. Insofar as it relates to point sources of contaminated storm water, adequate regulatory authority is provided under § 124.83 and § 125.52 of the regulations.

Regarding enforcement, it is the Agency's position that the permittee has the

burden of demonstrating that his discharge is excluded under subsection (b)(1)(ii) of §§ 129.100–103.

New York State also commented that the § 307(a) standards would limit pollution from air fallout to amounts not to exceed levels resulting in 0.003 μg/l for aldrin/dieldrin or 0.001 μg/l for DDT, DDD and DDE in the receiving waters. Nothing in these standards is intended to directly or indirectly control receiving water concentrations of aldrin/dieldrin or DDT (DDD, DDE) by regulating air emissions of these compounds.

(2) Several commenters mentioned possible adverse environmental effects resulting from the use of evaporation ponds. New York State recommended use of either a chemical landfill or total incineration.

The Agency concurs that an evaporation pond can pose a threat to wildlife if not properly screened and fenced. The Agency also recognizes that air emissions from ponds and landfills and leaching from landfills could possibly be sources of contamination, if appropriate facilities are not used. The amount of evaporative losses to be expected from aldrin/dieldrin and DDT (DDD, DDE) is unknown. Data showing the presence of these materials in bottom materials of natural water bodies over long periods of time confirm the Agency's expectation that these pesticidal materials would be tightly adsorbed to bottom sludges. This would indicate that losses as vapors are likely to be insignificant.

In any event it is the Agency's position that where an evaporation pond, landfill or incineration is suggested as an alternative technology for disposal of toxic wastes, only suitably designed, located and operated facilities should be considered for such disposal. Specifications for such facilities are outside the scope of these standards.

(3) Several comments were received with respect to the site-specificity and cost of the evaporation pond technology identified by the Agency as a treatment system applicable to aldrin/dieldrin and DDT, (DDD, DDE) manufacturers and formulators.

The Agency recognizes the limitations inherent in the evaporation pond technology. In areas where precipitation greatly exceeds evaporation this technology may be inappropriate. However, even in areas with a net precipitation balance, the evaporation pond may be supplemented with the use of heating, aeration, fixed or movable roofing systems, and wicks to enhance evaporation. Furthermore, the volume of wastes to be treated may be reduced by the roofing over of areas subject to the regulations in order to prevent runoff, or by the elimination of water from the process.

The Shell Oil Company commented that the Agency's projected capital cost of $25,000 and annual operating cost of $6,000 for an evaporation pond servicing a projected 1 million pound per year aldrin production plant might be too low due to the need for a larger size pond than the one evaluated in the MRI report. In light of these comments the Agency again reviewed the design criteria and costs with its contractor, Midwest Research Institute (MRI). This review confirmed the Agency's belief that the technology is feasible and the costs are reasonable.

It is expected that this technology could be used, if at all, by a new source. If an existing source should seek to install this technology the costs could be greater, depending on its particular climatological and physical circumstances. Thus an existing source may wish to consider less costly alternatives. A new source, on the other hand, can avoid the potential problems of net precipitation balance through careful site selection and can reduce flow volume so that the size and cost of an evaporation pond would be minimized. While it is conceivable that in a given case site selection might result in "hidden" costs such as increased distance to market (or for that matter, hidden benefits), these costs and benefits are too speculative to be quantified by the Agency.

(4) New York State commented on the amount of dilution necessary to achieve the ambient water criteria and indicated that, taking into account background levels resulting from fallout, the effluent standards alone might be insufficient to ensure that the ambient water criterion would be met.

In the preamble to its June 10, 1976 proposal (41 FR 23579–80), the Agency acknowledged its reliance on dilution and dispersion of wastewater discharged into the navigable waters to achieve the ambient water criteria. During the course of the hearings, the Agency presented the testimony of Dr. William Brungs and Dr. Richard Callaway, both experts in the area of "mixing zones," in support of its standards.

The Agency believes that sufficient dilution and dispersion will occur in virtually all situations. However, in the event that such dilution and dispersion do not occur, § 129.7 of the regulations provides a "tightening variance" whereby a more stringent effluent limitation may be established to achieve the ambient water criterion where insufficient dispersion takes place.

(5) The U.S. Department of Agriculture indicated that the time allowed for interagency review was insufficient.

The Agency agrees that the time frame for review was short, but the Agency was unable to allow further time for review under the constraints of the statute and the consent agreement in *NRDC* v. *Train*, Civ. No. 75–172, supra.

(6) The U.S. Department of Agriculture indicated that there was insufficient evidence to justify "zero discharge" standards for the four pesticides under consideration and that they could result in plant closures.

With respect to aldrin/dieldrin and DDT, DDD and DDE, as indicated elsewhere herein the Agency has received no comment from manufacturers or formulators suggesting that the standards cannot be met. With respect to endrin and toxaphene, zero discharge applies only to formulators. The Agency believes that the reports cited in its statements of basis and purpose present sufficient evidence to justify zero discharge standards for formulators of endrin and toxaphene and for manufacturers and formulators of aldrin/dieldrin and DDT (DDD, DDE). These reports indicate that the standards will not have a significant economic impact.

(7) The U.S. Department of Agriculture suggested that the test protocols used to evaluate toxicity do not evaluate metabolism or degradation of the compounds and that the tests do not determine how pH, hardness, turbidity and temperature affect the ultimate fate of the chemicals in the environment. USDA requested that an environmental impact statement and an inflation impact statement be filed.

To determine the environmental fate of the four substances under all the possible conditions of pH, temperature and the like would be administratively infeasible. The EPA believes the studies submitted as part of its statement of basis and purpose adequately demonstrate the persistence of the toxic substances in question.

Section 511 of the Act provides that no action of the Administrator shall be deemed a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969 ("NEPA"), 83 Stat. 852, with exceptions not pertinent here. Thus, under § 101(b) of NEPA an environmental impact statement is not required. And, as discussed elsewhere herein, the Agency does not believe an inflation impact statement is required.

(8) The National Agricultural Chemicals Association ("NACA") criticized the procedures and time frames required to be followed prior to promulgation of the standard, stating that the procedures precluded the assembly of a fair and impartial record and that additional time for gathering evidence should be allowed.

At the time the Rules of Pratice were proposed, the public was afforded ample opportunity to submit comments and all such comments were taken into consideration by the Agency prior to their final promulgation of the rules. NACA should have made its criticisms of the Rules of Practice then. The short time frame for the standard-setting process is mandated by § 307(a) of the Act, which indicates that Congress considered toxic pollutant discharges a very serious matter. The Agency believes that its Rules of Practice permit compilation of a fair and impartial record.

The Agency agrees that the time frame for the development of toxic pollutant effluent standards under § 307(a) is very short. If NACA believes that a longer period is more appropriate, it should address this suggestion to Congress.

(9) NACA commented that the Agency should not have given less weight to economic and technological consideration than to environmental and public health considerations.

As explained in the preamble to the June 10, 1976 proposal (41 FR at 23578), the Agency is required under § 307(a) of the Act to place primary concern on the protection of environmental health. While the Agency believes that standards

could have been set without regard to technological or economic considerations, in the absence of anything in the statute precluding consideration of such factors, the Agency concluded that the interests of responsible rulemaking would be best served by at least giving them some consideration in the rulemaking process. There is no basis in the statute for giving equal or greater weight to economic and technological considerations than to environmental and public health considerations.

(10) NACA and the Pesticide Formulators Association ("PFA") questioned the reliability of responses received from the telephone survey conducted by ADL during the preparation of their report assessing the economic impact of the standards on the formulator industry. The survey had sought information from formulators as to the feasibility of compliance with the effluent standards. NACA and PFA claimed that ADL's failure to identify the purpose of its survey caused the respondents to withhold information as to known difficulties which they had experienced with formulator waste treatment systems.

The telephone survey was used for the limited purpose of confirming information assessing the feasibility of compliance with the standards as proposed. The survey served as a mechanism to elicit constructive comments from those formulators who would potentially be affected by the regulations but it was not the sole basis for the economic assessment for the Agency's standards. Technology assessment was based principally on the MRI report, which included visits to plants. The ADL report should be considered reliable in light of the limited purpose for which the telephone survey was made.

Formulators were given the opportunity to participate in the hearings, but none did so. Written comments submitted on behalf of formulators contained only generalized and unsupported assertions that the standards cannot be met. In the absence of specific evidence submitted by formulators, the Agency cannot disregard the carefully researched and considered opinions of its contractors.

(11) NACA claimed that a zero discharge requirement for formulators was unreasonable due to an inability to collect and process runoff water.

In its supporting materials for the § 307(a) standards, the Agency addressed the technological problems in applying the standards to formulators. As part of its review, the Agency identified a technology incorporating the use of roofing, diking and other methods to eliminate the pesticidal contamination of runoff from formulator facilities. The Agency concluded that the application of the identified technology was both technologically and economically feasible for both large and small formulators. The Agency also identified the evaporation lagoon as an alternative for formulators where such a facility would be feasible.

(12) The National Fisheries Institute supported the proposed regulations and stated that the proposed standard for toxaphene and endrin manufacturers would provide an adequate degree of protection to fish, wildlife and humans. They urged the expeditious promulgation of pretreatment standards for discharges of these toxic pollutants into publicly owned treatment works and stressed the importance of further monitoring of endrin and toxaphene discharges in order to assess the need for more stringent standards.

The Agency is in agreement with these suggestions. As stated in the preamble to the Notice of Proposed Rulemaking, the Agency is in the process of developing pretreatment standards for these pesticides. It will, moreover, continue to monitor for their presence in the nation's waters to determine whether in the future the standards established at this time should be revised so as to provide greater stringency.

(13) PFA disagreed with the Agency's cost figures for pesticide formulator compliance with a zero discharge limitation. The comment said that based on MRI estimates, costs for installing evaporation lagoons, diking, and pumping of storm water, would involve capital investments of $48,200 and an annual operating expense of $10,110, thereby causing a 50 percent increase in a facility's capital value for an average 175,000 pounds per year toxaphene formulation plant.

The comment misinterprets the cost figures provided by MRI to the Agency and assumes that use of an evaporation lagoon would be required. The estimated costs for compliance by formulators were from $1,000 to $4,000 (see 41 FR at 23585). These costs would cover roofing, diking and other runoff control measures.

If the runoff control measures were implemented, the Agency does not believe that the use of an evaporation lagoon would be required. PFA acknowledged that in the formulator industry, processes are designed for zero discharge of process and waste streams.

Since the estimated cost of runoff control facilities is nominal, the Agency believes that the economic impact upon the formulator industry would be insubstantial. Since presently available technology can achieve a prohibition without substantial adverse economic impact to formulators, the Agency believes that it is reasonable to require compliance with this admittedly very stringent standard.

(14) PFA suggests that formulators should be allowed to discharge as much as manufacturers.

The standard for manufacturers of toxaphene and endrin is less stringent than that for formulators for the reason that manufacturers cannot comply with a zero discharge standard whereas formulators can. The Act recognizes in § 307(a)(5) that different standards will be set for different categories of dischargers discharging the same substance. The standard for manufacturers is nevertheless considered sufficiently stringent to provide an ample margin of safety as required by § 307(a)(4).

(15) American Cyanamid questioned the analytical methods the Agency chose to use to determine whether a source is in compliance with the regulations. Their comment also suggested a modification of the "Method Section" (subsections (b)(2) and (c)(2) of §§ 129.102 and 129.103.)

The Agency's definition of "prohibited" as set forth at § 129.2(d) of the regulations specifies that the absence of the pollutant shall be determined by "any analytical method." For the "Analytical Methods Acceptable" sections the Agency specifies the method set forth at 40 CFR Part 136 for those standards permitting a discharge. Where the standard is zero discharge, a larger sample size than that recommended in 40 CFR Part 136 is required to increase analytical sensitivity.

The Agency intends that the method specified in the Method Sections will be used to show presumptive compliance with the standard. However, the Agency has specifically reserved its prerogative to apply a more sensitive method to a particular discharge for determining whether a source is in compliance with a prohibition. Thus, if the prohibited pollutant should be detected by any method, the discharger will be found to be in violation of the standards. A discharger may raise any challenge to the more sensitive method in the enforcement proceedings.

(16) One commenter disagreed with the Agency's findings that DDT is acutely toxic to fish, animals and man and that it is among the most highly toxic of those substances known.

The Agency set forth considerable data as to the toxicity, persistence, degradability and environmental fate and effects of DDT (DDD, DDE) in the Criteria Document for DDT (DDD, DDE) which was an integral part of the Agency's statement of basis and purpose underlying the regulations. In light of the overwhelming evidence documenting the harmful environmental effects of DDT and its metabolites, the Agency concludes that its statements supporting a prohibition of DDT are warranted and that such a prohibition is necessary to provide an ample margin of safety. The cancellation of most uses of DDT pursuant to proceedings under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) further bolsters the Agency's conclusions that DDT is highly toxic and indeed poses a cancer risk to man.

(17) The Ford Motor Company submitted comments objecting to the inclusion of an ambient water criterion for each of the four pesticides on the grounds that this exceeded the Agency's authority under section 307(a) of the Act. If the Agency should choose to include them, however, Ford urged the adoption of the criteria on a case-by-case basis, claiming that national criteria were scientifically inappropriate and unnecessary.

Since these are national standards, a case-by-case approach to the ambient water criteria would be inappropriate and would require extensive duplication of effort. It should also be noted that the criteria recommended by the Agency in these proceedings are consistent with those being recommended to the States under section 304(a) of the Act.

While establishment of such criteria are not legally required under section 307(a), they provide a most helpful in-

termediate step in establishing levels of effects to be avoided, and in setting, in turn, the effluent standards themselves which are to guard against such effects. They also provide a triggering mechanism for the "tightening variance clause" established in section 129.7 for water bodies to which a discharge at the levels in the standards still would not provide an ample margin of safety owing to site-specific peculiarities.

(18) Vicksburg Chemical Company charged that the Agency had failed to consider the cost of analytical requirements and its impact on the small pesticide manufacturers.

The MRI reports which assessed the available treatment technologies for each of the four pesticides at issue included "laboratory" costs as direct costs. In addition to using the MRI report evaluations as the basis for its own report, ADL included estimated analytical costs of $40,000 per year for outside laboratory work in its economic assessment of the standards.

The Agency notes that no additional cost would be incurred for those sources whose NPDES permits already require pesticide analyses to be performed since the monitoring required by the proposed regulations would essentially duplicate that presumably already required in the NPDES permit.

(19) Vicksburg Chemical Company claimed that the Agency failed to establish that present discharges of toxaphene from existing point sources are causing the ambient water criterion set forth in the standards to be exceeded. Vicksburg further claimed that the Agency did not provide "demonstrated" technology for new source performance standards pursuant to sections 304 and 306 of the Act.

By these comments, the company clearly misinterprets the Agency's authority to establish effluent standards for toxic pollutants under section 307(a) of the Act. Since chlorinated hydrocarbon pesticides including toxaphene have been found to be highly toxic to a wide variety of organisms and to be highly persistent in the environment, these regulations are intended to provide protection against anticipated damage from the continued accumulation of these materials in the environment. Discharges in excess of the standards urged by the Agency for existing sources are likely to result in the ambient water criterion being exceeded, at least in some locations; hence the need for the standards. The standards for new sources provide an even more ample margin of safety, as the Agency is clearly authorized to do under section 307(a). Section 307(a) standards are technology-forcing regulations and need not be based on existing, in-place technology. The provisions of sections 304 and 306 do not apply to standards issued under section 307(a).

(21) Objections were received with respect to three sections of the general regulations: § 129.6, relating to credit for pollutants in the intake water; § 129.5(c) relating to revision of NPDES permits to require compliance with a toxic pollutant effluent standard; and § 129.7 relating to the "tightening variance."

As indicated above, the general regulatory provisions are not "standards" subject to the formal rulemaking procedure, but the Administrator has included them in the June 10 proposal to ensure informed rulemaking.

Objection was made to § 129.6 (the so-called "net-gross" regulation), which relates to adjustment of the effluent standard for the presence of a toxic pollutant in the intake water, because credit is given only if the intake water is taken from the same body of water as that into which the discharge is made.

Section 129.6 is essentially the same as the Agency's net-gross regulations for NPDES permits issued under section 402 of the Act (40 CFR § 125.24(c) and § 125.28). Under all of these sections, in order to obtain credit for pollutants in the water supply the discharger must show (1) that the water supply and the receiving water are the same body of water and (2) that the pollutants in the water supply will not be removed by any wastewater treatment system whose design capacity and operation were such as to reduce pollutants to the level required by the standards in the absence of the pollutants in the water supply. Section 125.28 has been held valid in *Hooker Chemicals & Plastics Corp.* v. *Train*, 537 F. 2d 620, 633 (2d Cir. 1976) and *American Petroleum Institute* v. *EPA*, 9 E.R.C. 1252, 1261 (10th Cir. 1976). In each case the court specifically noted the "same body of water" restriction. In *Appalachian Power Co.* v. *Train*, 9 E.R.C. 1033, 1053–4, as modified 9 E.R.C. 1274 (4th Cir. 1976) and in *American Iron and Steel Institute* v. *EPA*, 526 F. 2d 1027, 1056 (3d Cir. 1975), a contrary result may be implied. The "same body of water" requirement was not squarely addressed in any of these cases, and the regulations have not been remaned to the Agency. Challenges to the net-gross regulations in *American Iron and Steel Institute* v. *Train*, Doc. No. 75–2124, 75–2148 (Third Circuit, Oct. 5, 1976) and *Diamond Shamrock Corp.* v. *Train*, Civ. No. 75–1917 (D. D. C. Oct. 22, 1976), were dismissed on the ground that the regulations were not ripe for judicial review until they had actually been applied to a discharge. The Agency believes the "same body of water" requirement in § 129.6 of the proposed regulation is valid.

American Iron and Steel Institute ("AISI") also objects to § 129.6 because it provides that credit for pollutants in the water supply will not be granted unless:

> it is *demonstrated* * * * that the toxic pollutants present in the owner's or operator's intake water will not be removed by *any* wastewater treatment systems whose design capacity and operation were such as to reduce toxic pollutants to the levels required by the applicable toxic pollutant effluent standards in the absence of the toxic pollutant in the intake water. 41 FR 23593 (June 10, 1976.) [emphasis added]

AISI interprets this to mean that if "any conceivable" wastewater treatment would remove the pollutants credit will not be allowed. This result is not intended by the Agency. The word "any" refers to whatever wastewater treatment systems are in place or planned, so long as their design and operation is such as to reduce toxic pollutants to the levels required by the applicable standard.

AISI also objects that the proposed regulations deny credit when a discharger treats its water before using it. A similar provision was contained in § 125.28 of the regulations, which was upheld in *American Petroleum Institute* v. *EPA*, *supra*. The Agency continues to believe that such a provision correctly interprets the Act.

AISI objected to § 129.7 because it does not provide for a "loosening" variance where local conditions permit. The Agency believes that § 307(a) requires nationally applicable toxic pollutant effluent standards. The effect of the modification proposed by AISI would be to require the Agency to make site-specific determinations whenever requested by a discharger. This would not only be administratively burdensome on the Agency, but it would completely undermine the national standard set forth in the regulations.

As the court said in *Gulf Oil Corp.* v. *Hickel*, 435 F. 2d 440 (D.C. Cir. 1970),

> "Administrative agencies and officers have a primary task to administer broad policy mandates for the common good of our society, and they cannot be required to refine their rules to assure tailormade equity for each of the complexities that may arise." (at 447)

The tightening variance allows the Agency to promulgate a reasonable national standard, not unduly overprotective, while at the same time assuring that in all cases an "ample margin of safety" will be provided for.

CONCLUSIONS

1. The regulations of general application proposed in the FEDERAL REGISTER on June 10, 1976, 41 FR 23576 et seq., as § 129.1–§ 129.8 of Chapter I of Title 40, Code of Federal Regulations, provide a sound framework for the implementation of the toxic pollutant effluent standards in accordance with the requirements of § 307(a) of the Act and should be promulgated as proposed.

2. The toxic pollutant effluent standards proposed by the Agency for aldrin/dieldrin (§ 129.100) by publication in the FEDERAL REGISTER on June 10, 1976, 41 FR 23576 et seq., embody a careful and thorough consideration of the toxicity of aldrin/dieldrin, its persistance, degradability, the usual or potential presence of affected organisms in any waters, the importance of the affected organisms, and the nature and extent of the effect of aldrin/dieldrin on such organisms, as required by § 307(a) of the Act. The standards provide an ample margin of safety for aquatic and other organisms and consumers thereof, including humans, who may be affected by discharges by manufacturers or formulators of aldrin/dieldrin and fully comply with the requirements of § 307(a). They are technologically achievable and are not likely to result in serious adverse economic impact to the pesticide manufacturing or formulator industries or to the Nation.

The toxic pollutant effluent standards proposed by the Agency for aldrin/diel-

drin are fully supported by substantial evidence on the record as a whole. No modification of such standards is justified "based upon a preponderance of evidence" adduced at the hearings within the meaning of § 307(a)(2) of the Act, and such standards should be promulgated as proposed.

3. The toxic pollutant effluent standards proposed by the Agency for DDT (DDD, DDE) (§ 129.101) by publication in the FEDERAL REGISTER on June 10, 1976, 41 F.R. 23576 et seq., embody a careful and thorough consideration of the toxicity of DDT (DDD, DDE), its persistence, degradability, the usual or potential presence of affected organisms in any waters, the importance of the affected organisms, and the nature and extent of the effect of DDT (DDD, DDE) on such organisms, as required by § 307(a) of the Act. These standards provide an ample margin of safety for aquatic and other organisms and consumers thereof, including humans, who may be affected by discharges by manufacturers or formulators of DDT (DDD, DDE) and fully comply with the requirements of § 307(a) of the Act. They are technologically achievable and are not likely to result in serious adverse economic impact to the pesticide manufacturing or formulating industries or to the nation.

The toxic pollutant effluent standards proposed by the Agency for DDT (DDD, DDE) are fully supported by substantial evidence on the record as a whole. No modification of such standards is justified "based upon a preponderance of evidence" adduced at the hearing within the meaning of § 307(a)(2) of the Act, and such standards should be promulgated as proposed.

4. The toxic pollutant effluent standards proposed by the Agency for endrin (§ 129.102) by publication in the FEDERAL REGISTER on June 10, 1976, 41 FR 23576 et seq., embody a careful and thorough consideration of the toxicity of endrin, its persistence, degradability, the usual or potential presence of affected organisms in any waters, the importance of the affected organisms, and the nature and extent of the effect of endrin on such organisms, as required by § 307(a) of the Act. The toxic pollutant effluent standard proposed by the Agency for endrin for existing manufacturers of 1.5 μg/l, together with the mass emission standard set forth below, provides an ample margin of safety for aquatic and other organisms and consumers thereof (including humans) who may be affected by discharges by manufacturers of endrin.

The mass emission standard for existing manufacturers of endrin set forth in § 129.102(b)(3)(i), for the reasons stated above, should be modified from 0.0003 kg/kkg of endrin produced, as proposed, to 0.0006 kg/kkg of endrin produced and provision should be made for situations in which there is no production. As thus modified, this mass emission standard will provide reasonable protection against the use of dilution alone as a means to comply with the concentration standard which would result in the discharge of unjustifiably large amounts of endrin to the environment. For the same reasons, the mass emission standard for new manufacturing sources of endrin set forth in § 129.102(b)(3)(ii), should be modified from 0.00002 kg/kkg of endrin produced to 0.00004 kg/kkg of endrin produced, and to provide for situations in which there is no production.

The toxic pollutant effluent standards proposed by the Agency for endrin formulators provide a very ample and indeed the maximum margin of safety for aquatic and other organisms and consumers thereof, including humans, who may be affected by discharges by formulators of endrin.

The toxic pollutant effluent standards proposed by the Agency for endrin, as thus modified, fully comply with the requirements of § 307(a) of the Act, are technologically achievable, and are not likely to result in serious adverse economic impact to the industry or to the nation.

The toxic pollutant effluent standards proposed by the Agency for endrin, with the modifications set forth above, are fully supported by substantial evidence on the record as a whole. No further modification of the standards proposed by the Agency for endrin is justified "based upon a preponderance of evidence" in the record of the hearings within the meaning of § 307(a)(2) of the Act, and such standards should be promulgated as proposed, with the exception of the modification of the mass emission standard as set forth above.

5. The toxic pollutant effluent standards proposed by the Agency for toxaphene (§ 129.103) by publication in the FEDERAL REGISTER on June 10, 1976, 41 FR 23576 et seq., embody a careful and thorough consideration of the toxicity of toxaphene, its persistence, degradability, the usual or potential presence of affected organisms in any waters, the importance of the affected organisms, and the nature and extent of the effect of toxaphene on such organisms, as required by § 307(a) of the Act. The toxic pollutant effluent standard proposed by the Agency for toxaphene for existing manufacturers of 1.5 μg/l, together with the mass emission standard set forth below, provides an ample margin of safety for aquatic and other organisms and consumers thereof (including humans) who may be affected by discharges by manufacturers of toxaphene.

The mass emission standard for existing manufacturers of toxaphene set forth in § 129.103(b)(3)(i), for the reasons stated above, should be modified from 0.00001 kg/kkg of toxaphene produced, as proposed, to 0.00003 kg/kkg of toxaphene produced, and provision should be made for situations in which there is no production. As thus modified, this mass emission standard will provide reasonable protection against the use of dilution alone as a means to comply with the concentration standard, which would result in the discharge of unjustifiably large amounts of toxaphene to the environment. For the same reasons, the mass emission standard for new manufacturing sources of toxaphene set forth in § 129.103(b)(3)(ii) should be modified from 0.0000006 kg/kkg of toxaphene to 0.000002 kg/kkg of toxaphene produced, and provision should be made for situations in which there is no production.

The toxic pollutant effluent standard proposed by the Agency for toxaphene for new manufacturing sources of 0.1 μg/l, together with the mass emission standard set forth in the preceding paragraph, provides an ample margin of safety for aquatic and other organisms and consumers thereof (including humans) who may be affected by discharges by manufacturers of endrin.

The toxic pollutant effluent standards proposed by the Agency for toxaphene, as thus modified, fully comply with the requirements of section 307(a) of the Act, are technologically achievable, and are not likely to result in serious adverse economic impact to the industry or to the nation.

The toxic pollutant effluent standards proposed by the Agency for toxaphene, with the modifications set forth above, are fully supported by substantial evidence on the record as a whole. No further modification of the standards proposed by the Agency for toxaphene is justified "based upon a preponderance of evidence" adduced at the hearings, within the meaning of section 307(a)(2) of the Act, and such standards should be promulgated as proposed, with the exception of the modification of the mass emission standard set forth above.

6. In subsections (b)(1)(i)(B)(1) and (c)(1)(i)(B)(1) of §§ 129.100–129.103 as proposed, there was the following language setting forth the application of the standards to stormwater and other runoff:

> These standards or prohibitions apply to:
>
> * * * * *
>
> (B) All discharges from the manufacturing areas, loading and unloading areas, storage areas and other areas which are subject to direct contamination by (the toxic pollutant) as a result of the mnaufacturing process, including but not limited to stormwater and other runoff.

Subsection (ii) of each of those sections then provided as follows:

> These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of (the toxic pollutant); or to stormwater runoff that exceeds that from the ten year 24-hour rainfall event.

For clarification, each of the subsections mentioned above should be amended by inserting after the words "stormwater and other runoff" the following language: "except as hereinafter provided in subsection (ii)".

Effective date: The amendments as hereinafter promulgated will become effective January 12, 1977. Due to the operation of § 129.8 as promulgated below, the compliance date for the standards promulgated below will be January 12, 1978.

Dated: December 30, 1976.

RUSSELL E. TRAIN,
Administrator.

Chapter I of Title 40, Code of Federal Regulations, is amended by revising Part 129 so as to provide as follows:

Subpart A—Toxic Pollutant Effluent Standards and Prohibitions

Sec.

129.1 Scope and purpose.
129.2 Definitions.
129.3 Abbreviations.
129.4 Toxic pollutants.
129.5 Compliance.
129.6 Adjustment of effluent standard for presence of toxic pollutant in the intake water.
129.7 Requirement and procedure for establishing a more stringent effluent limitation.
129.8 Compliance date.
129.9–129.99 [Reserved]
129.100 Aldrin/Dieldrin.
129.101 DDT, DDD and DDE.
129.102 Endrin.
129.103 Toxaphene.

AUTHORITY: Sec. 307, 308, and 501 of the Federal Water Pollution Control Act Amendments of 1972 (Pub. L. 92–500, 86 Stat. 816, 33 U.S.C. 1251 et seq.).

Subpart A—Toxic Pollutant Effluent Standards and Prohibitions

§ 129.1 Scope and Purpose.

(a) The provisions of this Subpart apply to owners or operators of specified facilities discharging into navigable waters.

(b) The effluent standards or prohibitions for toxic pollutants established in this Subpart shall be applicable to the sources and pollutants hereinafter set forth, and may be incorporated in any NPDES permit, modification or renewal thereof, in accordance with the provisions of this Subpart.

(c) The provisions of 40 CFR Parts 124 and 125 shall apply to any NPDES permit proceedings for any point source discharge containing any toxic pollutant for which a standard or prohibition is established under this Part.

§ 129.2 Definitions.

All terms not defined herein shall have the meaning given them in the Act or in 40 CFR Parts 124 or 125. As used in this Part, the term:

(a) "Act" means the Federal Water Pollution Control Act, as amended (Pub. L. 92–500, 86 Stat. 816 et seq., 33 U.S.C. 1251 et seq.). Specific references to sections within the Act will be according to Pub. L. 92–500 notation.

(b) "Administrator" means the Administrator of the Environmental Protection Agency or any employee of the Agency to whom the Administrator may by order delegate the authority to carry out his functions under section 307(a) of the Act, or any person who shall by operation of law be authorized to carry out such functions.

(c) "Effluent standard" means, for purposes of § 307, the equivalent of "effluent limitation" as that term is defined in section 502(11) of the Act with the exception that it does not include a schedule of compliance.

(d) "Prohibited" means that the constituent shall be absent in any discharge subject to these standards, as determined by any analytical method.

(e) "Permit" means a permit for the discharge of pollutants into navigable waters under the National Pollutant Discharge Elimination System established by section 402 of the Act and implemented in regulations in 40 CFR Parts 124 and 125.

(f) "Working day" means the hours during a calendar day in which a facility discharges effluents subject to this Part.

(g) "Ambient water criterion" means that concentration of a toxic pollutant in a navigable water that, based upon available data, will not result in adverse impact on important aquatic life, or on consumers of such aquatic life, after exposure of that aquatic life for periods of time exceeding 96 hours and continuing at least through one reproductive cycle; and will not result in a significant risk of adverse health effects in a large human population based on available information such as mammalian laboratory toxicity data, epidemiological studies of human occupational exposures, or human exposure data, or any other relevant data.

(h) "New Source" means any source discharging a toxic pollutant, the construction of which is commenced after proposal of an effluent standard or prohibition applicable to such source if such effluent standard or prohibition is thereafter promulgated in accordance with section 307.

(i) "Existing Source" means any source which is not a new source as defined above.

(j) "Source" means any building, structure, facility, or installation from which there is or may be the discharge of toxic pollutants designated as such by the Administration under section 307(a)(1) of the Act.

(k) "Owner or operator" means any person who owns, leases, operates, controls, or supervises a source as defined above.

(l) "Construction" means any placement, assembly, or installation of facilities or equipment (including contractual obligations to purchase such facilities or equipment) at the premises where such equipment will be used, including preparation work at such premises.

(m) "Manufacturer" means any establishment engaged in the mechanical or chemical transformation of materials or substances into new products including but not limited to the blending of materials such as pesticidal products, resins, or liquors.

(n) "Process Wastes" means any designated toxic pollutant, whether in wastewater or otherwise present, which is inherent to or unavoidably resulting from any manufacturing process, including that which comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, by-product or waste product and is discharged into the navigable waters.

(o) "Air emissions" means the release or discharge of a toxic pollutant by an owner or operator into the ambient air either (1) by means of a stack or (2) as a fugitive dust, mist or vapor as a result inherent to the manufacturing or formulating process.

(p) "Fugitive dust, mist or vapor" means dust, mist or vapor containing a toxic pollutant regulated under this Part which is emitted from any source other than through a stack.

(q) "Stack" means any chimney, flue, conduit, or duct arranged to conduct emissions to the ambient air.

(r) "Ten year 24-hour rainfall event" means the maximum precipitation event with a probable recurrence interval of once in 10 years as defined by the National Weather Service in technical paper No. 40, "Rainfall Frequency Atlas of the United States," May 1961, and subsequent amendments or equivalent regional or State rainfall probability information developed therefrom.

(s) "State Director" means the chief administrative officer of a State or interstate water pollution control agency operating an approved HPDES permit program. In the event responsibility for water pollution control and enforcement is divided among two or more State or interstate agencies, the term "State Director" means the administrative officer authorized to perform the particular procedure to which reference is made.

§ 129.3 Abbreviations.

The abbreviations used in this Part represent the following terms:

lb=pound (or pounds)
g=gram
μg/l=micrograms per liter (1 one-millionth gram/liter)
kg=kilogram(s)
kkg=1000 kilogram(s)

§ 129.4 Toxic pollutants.

The following are the pollutants subject to regulation under the provisions of this subpart:

(a) Aldrin/Dieldrin—"Aldrin" means the compound aldrin as identified by the chemical name, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a - hexahydro - 1,4 - endo - 5,8 - exo - dimethanonaphthalene; "Dieldrin" means the compound dieldrin as identified by the chemical name 1,2,3,4,10,10-hexachloro - 6,7 - epoxy - 1,4,4a,5,6,7,8,8a - octahydro - 1,4-endo - 5,8-exo-dimethanonaphthalene.

(b) DDT—"DDT" means the compounds DDT, DDD, and DDE as identified by the chemical names: (DDT) -1,1,1-trichloro-2,2 - bis(p - chlorophenyl) ethane and some o,p'-isomers; (DDD) or (TDE) - 1,1 - dichloro - 2,2 - bis(p-chlorophenyl) ethane and some o,p'-isomers; (DDE) - 1,1 - dichloro - 2,2-bis (p-chlorophenyl) ethylene.

(c) Endrin—"Endrin" means the compound endrin as identified by the chemical name 1,2,3,4,10,10-hexachloro-6,7-epoxq - 1,4,4a,5,6,7,8,8a - octahydro - 1,4-endo-5,8-endo-dimethanonaphthalene.

(d) Toxaphene—"Toxaphene" means a material consisting of technical grade chlorinated camphene having the approximate formula of $C_{10}H_{10}Cl_8$ and normally containing 67–69 percent chlorine by weight.

§ 129.5 Compliance.

(a)(1) Within 60 days from the date of promulgation of any toxic pollutant effluent standard or prohibition each owner or operator with a discharge subject to that standard or prohibition must notify the Regional Administrator (or State Director, if appropriate) of such discharge. Such notification shall include such information and follow such procedures as the Regional Administrator (or State Director, if appropriate) may require.

(2) Any owner or operator who does not have a discharge subject to any toxic pollutant effluent standard at the time of such promulgation but who thereafter commences or intends to commence any activity which would result in such a discharge shall first notify the Regional Administrator (or State Director, if appropriate) in the manner herein provided at least 60 days prior to any such discharge.

(b) Upon receipt of any application for issuance or reissuance of a permit or for a modification of an existing permit for a discharge subject to a toxic pollutant effluent standard or prohibition the permitting authority shall proceed thereon in accordance with 40 CFR Parts 124 or 125, whichever is applicable.

(c)(1) Every permit which contains limitations based upon a toxic pollutant effluent standard or prohibition under this Part is subject to revision following the completion of any proceeding revising such toxic pollutant effluent standard or prohibition regardless of the duration specified on the permit.

(2) For purposes of this section, all toxic pollutants for which standards are set under this Part are deemed to be injurious to human health within the meaning of section 402(k) of the Act unless otherwise specified in the standard established for any particular pollutant.

(d)(1) Upon the compliance date for any section 307(a) toxic pollutant effluent standard or prohibition, each owner or operator of a discharge subject to such standard or prohibition shall comply with such monitoring, sampling, recording, and reporting conditions as the Regional Administrator (or State Director, if appropriate) may require for that discharge. Notice of such conditions shall be provided in writing to the owner or operator.

(2) In addition to any conditions required pursuant to paragraph (d)(1) and to the extent not required in conditions contained in NPDES permits, within 60 days following the close of each calendar year each owner or operator of a discharge subject to any toxic standard or prohibition shall report to the Regional Administrator (or State Director, if appropriate) concerning the compliance fo such discharges. Such report shall include, as a minimum, information concerning (i) relevant identificatio nof the discharger such as name, location of facility, discharge points, receiving waters, and the industrial process or operation emitting the toxic pollutant; (ii) relevant conditions (pursuant to paragraph (d)(1) or to an NPDES permit) as to flow, section 307 (a) toxic pollutant concentrations, and section 307(a) toxic pollutant mass emission rate; (iii) compliance by the disharger with such conditions.

(3) When samples collected for analysis are composited, such samples shall be composited in proportion to the flow at time of collection and preserved in compliance with requirements of the Regional Administrator (or State Director, if appropriate), but shall include at least five samples collected at approximately equal intervals throughout the working day.

(e)(1) Nothing in these regulations shall preclude a Regional Administrator from requiring in any permit a more stringent effluent limitation or standard pursuant to section 301(b)(1)(C) of the Act and implemented in 40 CFR 125.11 and other related provisions of 40 CFR Part 125.

(2) Nothing in these regulations shall preclude the Director of a State Water Pollution Control Agency or interstate agency operating a National Pollutant Discharge Elimination System Program which has been approved by the Administrator pursuant to section 402 of the Act from requiring in any permit a more stringent effluent limitation or standard pursuant to section 301(b)(1)(C) of the Act and implemented in 40 CFR 124.42 and other related provisions of 40 CFR Part 124.

(f) Any owner or operator of a facility which discharges a toxic pollutant to the navigable waters and to a publicly owned treatment system shall limit the summation of the mass emissions from both discharges to the less restrictive standard, either the direct discharge standard or the pretreatment standard; but in no case will this Subsection allow a discharge to the navigable waters greater than the toxic pollutant effluent standard established for a direct discharge to the navigable waters.

(g) In any permit hearing or other administrative proceeding relating to the implementation or enforcement of these standards, or any modification thereof, or in any judicial proceeding other than a petition for review of these standards pursuant to section 509(b)(1)(C) of the Act, the parties thereto may not contest the validity of any national standards established in this Part, or the ambient water criterion established herein for any toxic pollutant.

§ 129.6 Adjustment of effluent standard for presence of toxic pollutant in the intake water.

(a) Upon the request of the owner or operator of a facility discharging a pollutant subject to a toxic pollutant effluent standard or prohibition, the Regional Administrator (or State Director, if appropriate) shall give credit, and shall adjust the effluent standard(s) in such permit to reflect credit for the toxic pollutant(s) in the owner's or operator's water supply if (1) the source of the owner's or operator's water supply is the same body of water into which the discharge is made and if (2) it is demonstrated to the Regional Administrator (or State Director, if appropriate) that the toxic pollutant(s) present in the owner's or operator's intake water will not be removed by any wastewater treatment systems whose design capacity and operation were such as to reduce toxic pollutants to the levels required by the applicable toxic pollutant effluent standards in the absence of the toxic pollutant in the intake water.

(b) Effluent limitations established pursuant to this section shall be calculated on the basis of the amount of section 307(a) toxic pollutant(s) present in the water after any water supply treatment steps have been performed by or for the owner or operator.

(c) Any permit which includes toxic pollutant effluent limitations established pursuant to this section shall also contain conditions requiring the permittee to conduct additional monitoring in the manner and locations determined by the Regional Administrator (or State Director, if appropriate) for those toxic pollutants for which the toxic pollutant effluent standards have been adjusted.

§ 129.7 Requirement and procedure for establishing a more stringent effluent limitation.

(a) In exceptional cases (1) where the Regional Administrator (or State Director, if appropriate) determines that the ambient water criterion established in these standards is not being met or will not be met in the receiving water as a result of one or more discharges at levels allowed by these standards, and (2) where he further determines that this is resulting in or may cause or contribute to significant adverse effects on aquatic or other organisms usually or potentially present, or on human health, he may issue to an owner or operator a permit or a permit modification containing a toxic pollutant effluent limitation at a more stringent level than that required by the standard set forth in these regulations. Any such action shall be taken pursuant to the procedural provisions of 40 CFR Parts 124 and 125, as appropriate. In any proceeding in connection with such action the burden of proof and of going forward with evidence with regard to such more stringent effluent limitation shall be upon the Regional Administrator (or State Director, if appropriate) as the proponent of such more stringent effluent limitation.

(3) Evidence in such proceeding shall include at a minimum: an analysis using data and other information to demonstrate receiving water concentrations of the specified toxic pollutant, projections of the anticipated effects of the proposed modification on such receiving water concentrations, and the hydrologic and hydrographic characteristics of the receiving waters including the occurrence of dispersion of the effluent. Detailed specifications for presenting relevant information by any interested party may be prescribed in guidance documents published from time to time, whose availability will be announced in the FEDERAL REGISTER.

(b) Any effluent limitation in an NPDES permit which a State proposes to issue which is more stringent than the toxic pollutant effluent standards promulgated by the Administrator is subject to review by the Administrator under section 402(d) of the Act. The Administrator may approve or disapprove such limitation(s) or specify another limitation(s) upon review of any record of any proceedings held in connection with the permit issuance or modification and any other evidence available to him. If he takes no action within ninety days of his receipt of the notification of the action of the permit issuing authority and any record thereof, the action of the State permit issuing authority shall be deemed to be approved.

§ 129.8 Compliance date.

(a) The effluent standards or prohibitions set forth herein shall be complied with not later than one year after promulgation unless an earlier date is established by the Administrator for an industrial subcategory in the promulgation of the standards or prohibitions.

(b) Toxic pollutant effluent standards or prohibitions set forth herein shall become enforceable under sections 307(d) and 309 of the Act on the date established in subsection (a) regardless of proceedings in connection with the issuance of any NPDES permit or application therefor, or modification or renewal thereof.

§§ 129.9–129.99 [Reserved]

§ 129.100 Aldrin/Dieldrin.

(a) *Specialized definitions*—(1) "Aldrin/Dieldrin Manufacturer" means a manufacturer, excluding any source which is exclusively an aldrin/dieldrin formulator, who produces, prepares or processes technical aldrin or dieldrin or who uses aldrin or dieldrin as a material in the production, preparation or processing of another synthetic organic substance.

(2) "Aldrin/Dieldrin Formulator" means a person who produces, prepares or processes a formulated product comprising a mixture of either aldrin or dieldrin and inert materials or other diluents, into a product intended for application in any use registered under the Federal Insecticide, Fungicide and Rodenticide Act, as amended (7 U.S.C. 135, et seq.).

(3) The ambient water criterion for aldrin/dieldrin in navigable waters is 0.003 μg/l.

(b) *Aldrin/Dieldrin manufacturer.*—(1) *Applicability.*

(i) These standards or prohibitions apply to:

(A) all discharges of process wastes; and

(B) all discharges from the manufacturing areas, loading and unloading areas, storage areas and other areas which are subject to direct contamination by aldrin/dieldrin as a result of the manufacturing process, including but not limited to:

(*1*) Stormwater and other runoff except as hereinafter provided in subparagraph (ii); and

(*2*) Water used for routine cleanup or cleanup of spills.

(ii) These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of aldrin/dieldrin; or to stormwater runoff that exceeds that from the ten year 24-hour rainfall event.

(2) *Analytical Method Acceptable.* Environmental Protection Agency method specified in 40 CFR Part 136, except that a 1-liter sample size is required to increase the analytical sensitivity.

(3) *Effluent Standard.*—(i) *Existing Sources.* Aldrin or dieldrin is prohibited in any discharge from any aldrin/dieldrin manufacturer.

(ii) *New Sources.* Aldrin or dieldrin is prohibited in any discharge from any aldrin/dieldrin manufacturer.

(c) *Aldrin/Dieldrin Formulator.*—(1) *Applicability.*

(i) These standards or prohibitions apply to:

(A) All discharges of process wastes; and

(B) All discharges from the formulating areas, loading and unloading areas, storage areas and other areas which are subject to direct contamination by aldrin/dieldrin as a result of the formulating process, including but not limited to:

(*1*) Stormwater and other runoff except as hereinafter provided in subparagraph (ii); and

(*2*) Water used for routine cleanup or cleanup of spills.

(ii) These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of aldrin/dieldrin; or to stormwater runoff that exceeds that from the ten year 24-hour rainfall event.

(2) *Analytical Method Acceptable.* Environmental Protection Agency method specified in 40 CFR Part 136, except that a 1-liter sample size is required to increase the analytical sensitivity.

(3) *Effluent Standard.*—(i) *Existing Sources.* Aldrin or dieldrin is prohibited in any discharge from any aldrin/dieldrin formulator.

(ii) *New Sources.* Aldrin or dieldrin is prohibited in any discharge from any aldrin/dieldrin formulator.

§ 129.101 DDT, DDD and DDE.

(a) *Specialized Definitions.* (1) "DDT Manufacturer" means a manufacturer, excluding any source which is exclusively a DDT formulator, who produces, prepares or processes technical DDT, or who uses DDT as a material in the production, preparation or processing of another synthetic organic substance.

(2) "DDT Formulator" means a person who produces, prepares or processes a formulated product comprising a mixture of DDT and inert materials or other diluents into a product intended for application in any use registered under the Federal Insecticide, Fungicide and Rodenticide Act, as amended (7 U.S.C. 135, et seq.).

(3) The ambient water criterion for DDT in navigable waters is 0.001 μg/l.

(b) *DDT Manufacturer.*—(1) *Applicability.*

(i) These standards or prohibitions apply to:

(A) All discharges of process wastes; and

(B) All discharges from the manufacturing areas, loading and unloading areas, storage areas and other areas which are subject to direct contamination by DDT as a result of the manufacturing process, including but not limited to:

(*1*) Stormwater and other runoff except as hereinafter provided in subparagraph (ii); and

(*2*) Water used for routine cleanup or cleanup of spills.

(ii) These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of DDT; or to stormwater runoff that exceeds that from the ten year 24-hour rainfall event.

(2) *Analytical Method Acceptable.*—Environmental Protection Agency method specified in 40 CFR Part 136, except that a 1-liter sample size is required to increase the analytical sensitivity.

(3) *Effluent Standard.*—(i) *Existing Sources.* DDT is prohibited in any discharge from any DDT manufacturer.

(ii) *New Sources.* DDT is prohibited in any discharge from any DDT manufacturer.

(c) *DDT Formulator.*—(1) *Applicability.* (i) These standards or prohibitions apply to:

(A) All discharges of process wastes; and

(B) All discharges from the formulating areas, loading and unloading areas, storage areas and other areas which are subject to direct contamination by DDT as a result of the formulating process, including but not limited to:

(*1*) Stormwater and other runoff except as hereinafter provided in subparagraph (ii); and

(*2*) Water used for routine cleanup or cleanup of spills.

(ii) These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of DDT; or to stormwater runoff that exceeds that from the ten year 24-hour rainfall event.

(2) *Analytical Method Acceptable.* Environmental Protection Agency method specified in 40 CFR Part 136, except that a 1-liter sample size is required to increase the analytical sensitivity.

(3) *Effluent Standard.*—(i) *Existing Sources.* DDT is prohibited in any discharge from any DDT formulator.

(ii) *New Sources.* DDT is prohibited in any discharge from any DDT formulator.

§ 129.102 Endrin.

(a) *Specialized definitions.* (1) "Endrin Manufacturer" means a manufacturer, excluding any source which is exclusively an endrin formulator, who produces, prepares or processes technical endrin or who uses endrin as a material

in the production, preparation or processing of another synthetic organic substance.

(2) "Endrin Formulator" means a person who produces, prepares or processes a formulated product comprising a mixture of endrin and inert materials or other diluents into a product intended for application in any use registered under the Federal Insecticide, Fungicide and Rodenticide Act, as amended (7 U.S.C. 135, et seq.).

(3) The ambient water criterion for endrin in navigable waters is 0.004 μg/l.

(b) *Endrin manufacturer*—(1) *Applicability.* (i) These standards or prohibitions apply to:

(A) All discharges of process wastes; and

(B) All discharges from the manufacturing areas, loading and unloading areas, storage areas and other areas which are subject to direct contamination by endrin as a result of the manufacturing process, including but not limited to: (*1*) Stormwater and other runoff except as hereinafter provided in subparagraph (ii); and (2) Water used for routine cleanup or cleanup of spills.

(ii) These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of endrin; or to stormwater runoff that exceeds that from the ten year 24-hour rainfall event.

(2) *Analytical Method Acceptable*—Environmental Protection Agency method specified in 40 CFR Part 136.

(3) *Effluent Standard*—(i) *Existing Sources*—Discharges from an endrin manufacturer shall not contain endrin concentrations exceeding an average per working day of 1.5 μg/l calculated over any calendar month; and shall not exceed a monthly average daily loading of 0.0006 kg/kkg of endrin produced; and shall not exceed 7.5 μg/l in a sample(s) representing any working day.

(ii) *New Sources*—Discharges from an endrin manufacturer shall not contain endrin concentrations exceeding an average per working day of 0.1 μg/l calculated over any calendar month; and shall not exceed a monthly average daily loading of 0.00004 kg/kkg of endrin produced; and shall not exceed 0.5 μg/l in a sample(s) representing any working day.

(iii) *Mass Emission Standard During Shutdown of Production*—In computing the allowable monthly average daily loading figure required under the preceding subparagraphs (i) and (ii), for any calendar month for which there is no endrin being manufactured at any plant or facility which normally contributes to the discharge which is subject to these standards, the applicable production value shall be deemed to be the average monthly production level for the most recent preceding 360 days of actual operation of the plant or facility.

(c) *Endrin Formulator*—(1) *Applicability.* (i) These standards or prohibitions apply to:

(A) All discharges of process wastes; and

(B) All discharges from the formulating areas, loading and unloading areas, storage areas and other areas which are subject to direct contamination by endrin as a result of the formulating process, including but not limited to: (*1*) Stormwater and other runoff except as hereinafter provided in subparagraph (ii); and (2) Water used for routine cleanup or cleanup of spills.

(ii) These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of endrin; or to storm-water runoff that exceeds that from the ten year 24-hour rainfall event.

(2) *Analytical Method Acceptable*—Environmental Protection Agency method specified in 40 CFR Part 136, except that a 1-liter sample size is required to increase the analytical sensitivity.

(3) *Effluent Standard*—(i) *Existing Sources*—Endrin is prohibited in any discharge from any endrin formulator.

(ii) New Sources—Endrin is prohibited in any discharge from any endrin formulator.

(d) The standards set forth in this Section shall apply to the total combined weight or concentration of endrin, excluding any associated element or compound.

§ 129.103 Toxaphene.

(a) *Specialized definitions.* (1) "Toxaphene Manufacturer" means a manufacturer, excluding any source which is exclusively a toxaphene formulator, who produces, prepares or processes toxaphene or who uses toxaphene as a material in the production, preparation or processing of another synthetic organic substance.

(2) "Toxaphene Formulator" means a person who produces, prepares or processes a formulated product comprising a mixture of toxaphene and inert materials or other diluents into a product intended for application in any use registered under the Federal Insecticide, Fungicide and Rodenticide Act, as amended (7 U.S.C. 135, *et seq.*).

(3) The ambient water criterion for toxaphene in navigable waters is 0.005 μg/l.

(b) *Toxaphene manufacturer*—(1) *Applicability.* (i) These standards or prohibitions apply to:

(A) All discharges of process wastes; and

(B) All discharges from the manufacturing areas, loading and unloading areas, storage areas and other areas which are subject to direct contamination by toxaphene as a result of the manufacturing process, including but not limited to: (*1*) Stormwater and other runoff except as hereinafter provided in subparagraph (ii); and (2) Water used for routine cleanup or cleanup of spills.

(ii) These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of toxaphene; or to stormwater runoff that exceeds that from the ten year 24-hour rainfall event.

(2) *Analytical Method Acceptable*—Environmental Protection Agency method specified in 40 CFR Part 136.

(3) *Effluent Standard*—(i) *Existing Sources*—Discharges from a toxaphene manufacturer shall not contain toxaphene concentrations exceeding an average per working day of 1.5 μg/l calculated over any calendar month; and shall not exceed a monthly average daily loading of 0.00003 kg/kkg of toxaphene produced, and shall not exceed 7.5 μg/l in a sample(s) representing any working day.

(ii) *New Sources*—Discharges from a toxaphene manufacturer shall not contain toxaphene concentrations exceeding an average per working day of 0.1 μg/l calculated over any calendar month; and shall not exceed a monthly average daily loading of 0.000002 kg/kkg of toxaphene produced, and shall not exceed 0.5 μ/l in a sample(s) representing any working day.

(iii) *Mass Emission During Shutdown of Production*—In computing the allowable monthly average daily loading figure required under the preceding subparagraphs (i) and (ii), for any calendar month for which there is no toxaphene being manufactured at any plant or facility which normally contributes to the discharge which is subject to these standards, the applicable production value shall be deemed to be the average monthly production level for the most recent preceding 360 days of actual operation of the plant or facility.

(c) *Toxaphene Formulator*—(1) *Applicability.* (i) These standards or prohibitions apply to:

(A) All discharges of process wastes; and

(B) All discharges from the formulating areas, loading and unloading areas, storage areas and other areas which are subject to direct contamination by toxaphene as a result of the formulating process, including but not limited to: (*1*) Stormwater and other runoff except as hereinafter provided in subparagraph (ii); and (2) Water used for routine cleanup or cleanup of spills.

(ii) These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of toxaphene; or to stormwater runoff that exceeds that from the ten year 24-hour rainfall event.

(2) *Analytical Method Acceptable*—Environmental Protection Agency method specified in 40 CFR Part 136, except that a 1-liter sample size is required to increase the analytical sensitivity.

(3) *Effluent Standards*—(i) *Existing Sources*—Toxaphene is prohibited in any discharge from any toxaphene formulator.

(ii) *New Sources*—Toxaphene is prohibited in any discharge from any toxaphene formulator.

(d) The standards set forth in this Section shall apply to the total combined weight or concentration of toxaphene, excluding any associated element or compound.

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[FRL 669-1]

PART 129—TOXIC POLLUTANT EFFLUENT STANDARDS

Standards for Benzidine; Final Decision

This is a rulemaking proceeding under section 307(a) of the Federal Water Pollution Control Act, as amended (the "Act"), 33 U.S.C. 1251 et seq. On June 30, 1976, the Environmental Protection Agency (the "Agency") proposed toxic pollutant effluent standards for benzidine pursuant to section 307(a)(2) of the Act. (41 FR 27012)

Because the deadline for this decison is December 30, 1976, I have determined in accordance with 40 CFR 104.14(c) that the preparation and filing of a tentative decision and related procedures pursuant to 40 CFR 104.14(b) should be omitted.

Timely objections to the proposed standards were received from the American Paper Institute, Inc. ("API") and the Benzidine Task Force of the Synthetic Organic Chemical Manufacturers Association ("SOCMA") and they were made parties to the proceeding in accordance with 40 CFR 104.3(a).

In addition, in accordance with 40 CFR 104.3(d), written comments were received by the Hearing Clerk from the following interested persons and were made part of the record:

American Cyanamid Company.
Natural Resources Defense Council, Inc.
Department of Environmental Conservation of the State of New York.
Department of Natural Resources of the State of Michigan.
Ford Motor Company.

In accordance with 40 CFR 104.4, when the proposed standards for benzidine were published in the FEDERAL REGISTER, the Agency also published a preamble thereto which included a description of the proposed standards, relevant background information, and a statement of the basis and purpose of the proposed standards. The regulations as proposed would establish effluent standards for all manufacturers of benzidine and benzidine-based dyes and the principal applicators or users of benzidine-based dyes, who discharge directly into the navigable waters. Standards were proposed for both existing and new sources. The principal applicator categories, and those which are covered in the Agency's standards, are manufacturers of paper goods, leather goods, and textile goods who use benzidine-based dyes in their processes.

As noted in the preamble to the proposed standards, the Agency identified three manufacturers of benzidine and benzidine-based dyes. Allied Chemical Company, GAF Corp., and Fabricolor, Inc. There are in addition numerous users of benzidine-based dyes in each of the three industrial categories noted above.

The statement of basis and purpose incorporated by reference the Agency's Criteria Document for Benzidine, which sets forth the relevant data concerning the toxicity, persistence, degradability, bioaccumulation, and related factors required by the Act to be considered by the Agency in setting toxic pollutant effluent standards under section 307(a). The principal findings and conclusions of this document are set forth in the preamble to the Notice of the Proposed Standards (41 FR 27014–27015). The numerous articles, reports, and other materials relied upon by the Agency in preparing this document were made publicly available at the time of proposal of the standards and were admitted into evidence.

In order to assist the Agency in gathering information concerning the present levels of discharge within the affected industries, as well as the various control technologies in practice or otherwise available to control the discharges of benzidine, the Agency engaged as a contractor Thomas M. Keinath, Ph.D., a recognized and highly qualified expert on wastewater treatment technology. His report, "Benzidine: Wastewater Treatment Technology", was also incorporated by reference and summarized in the Notice of Proposed Rulemaking (41 FR at 27013–27016). That report, as well as the references cited therein, were admitted into evidence at the hearing.

The background of the proposed standards, set forth at 41 FR 27012–27013, may be briefly summarized as follows. On July 6, 1973, the Agency published in the FEDERAL REGISTER a proposed list of nine toxic pollutants pursuant to section 307(a) of the Act (38 FR 18044). The nine substances were aldrin/dieldrin, benzidine, cadmium, cyanide, DDT (DDD, DDE), endrin, mercury, polychlorinated biphenyls and toxaphene. Following the receipt of public comments, the list was promulgated as proposed on September 7, 1973, together with a discussion of the Agency's selection criteria and responses to comments received on the proposed list (38 FR 24342 et seq.).

On December 23, 1973, the Agency proposed toxic pollutant effluent standards for each of these nine substances, together with a summary of the factors considered in setting the standards, and a list of point source categories of discharges proposed for coverage (38 FR 35388 et seq.). Although a hearing was held in early 1974 on those proposed standards, the Agency determined at the conclusion of the hearing that the record did not contain sufficient evidence on which to promulgate responsible and defensible standards for any of the substances. Accordingly, the Agency decided to gather additional data and repropose the standards, supported by an expanded data base. The present rulemaking therefore supersedes the proposal of December 27, 1973.

On June 10, 1976, the Agency proposed toxic pollutant effluent standards for aldrin/dieldrin, DDT (DDD, DDE), endrin, and toxaphene (41 FR 23576). Along with the proposed standards for those substances, the Agency proposed general implementing regulations, applicable to all standards issued under section 307(a) (41 FR 23592–23594, §§ 129.1–129.8). Toxic pollutant effluent standards for those four substances were promulgated along with implementing regulations, in my Final Decision on Toxic Pollutant Effluent Standards for Aldrin/Dieldrin, etc., dated December 30, 1976, 41 FR _____. Reference is hereby made to that Decision for a discussion of the general implementing regulations and the Agency's interpretation of section 307(a) of the Act. The general implementing regulations, as promulgated on December 30, 1976, are applicable to standards established hereunder for benzidine.

THE PROPOSED STANDARDS

The Criteria Document for Benzidine sets forth the relevant data on toxicity to aquatic and other organisms. A standard scientific method for measuring the toxicity of a pollutant is to determine the concentration of the pollutant in water which will kill 50 percent of the exposed population over a 96-hour period. This concentration is referred to as the 96-hour TL 50, or 96-hour LC 50, of the pollutant. Ninety-six hour TL 50 values from static bioassays with benzidine have ranged from 2.5 milligrams per liter (mg/l) for the red shiner to 20 mg/l for the fathead minnow. Benzidine has been detected in the Sumida River in Tokyo, Japan, at concentration of up to 233 micrograms per liter (μg/l), but has not been found in navigable waters in the United States, nor has it been found in drinking water supplies.

With respect to bioaccumulation, the highest bioaccumulation rate with respect to residues reported for benzidine has been for bluegills, which have been shown to bioaccumulate residues to a factor of 44 times the ambient water concentration.

Use of a conservative standard application factor of 0.01 as recommended by the National Academy of Sciences for the regulation of toxic pollutants, as applied to the 96-hour TL 50 of the most sensitive species tested, results in a level of 25 μg/l as an ambient water criterion which would protect aquatic life. However, of greater concern than toxicity to aquatic organisms are the human health effects of benzidine. Benzidine has been conclusively identified as a human carcinogen, primarily inducing cancer of the bladder. Although historically the principal exposure route to humans has been through occupational exposure, numerous facilities discharge effluents containing benzidine, thus producing the potential for exposure of human beings through contact or through ingestion of water or aquatic organisms. Because benzidine does not appear to be persistent

in the water column, and does not appear to greatly bioaccumulate in aquatic organisms, the principal objective of the agency in establishing an ambient water criterion has been to provide protection for human health, recognizing that any number below 25 μg/l would in turn be protective of aquatic organisms.

Because neither epidemiological nor other human dose-response data exist, an ambient water quality level protective of human health for benzidine was derived with the assistance of mathematical low-dose risk extrapolation modeling. (The extrapolations, which utilized the so-called "one hit" and Mantel-Bryan approaches, are set forth in Appendix 1 to the Benzidine Criteria Document.) It was estimated that the levels of benzidine likely to produce a risk of no more than one tumor per million people exposed to benzidine over a lifetime would range from 0.05 μg/l to 0.8 μg/l, depending upon which of the data sets is used and which extrapolation method is employed. Calculations based upon a risk of one tumor per 500,000 people exposed, or 10,000,000 exposed, do not substantially change this range.

These extrapolation methods are inherently imprecise, and were not therefore the only factor considered in setting the criteria number. They were used solely to furnish some indication of relationship between exposure levels and potential risks. Such methods must be used carefully and in coordination with all of the data available in establishing protective criteria. Moreover, the figures are likely to be over-protective because the extrapolation assumes a continuing lifetime exposure to two liters of water each day containing the calculated benzidine concentration. The use of this type of extrapolation modeling is still in its early stages, and was used by the Agency for general guidance to indicate a range of risks which might be associated with various exposure levels (see In Re: "Velsicol Chemical Corporation, et al.," FIFRA Docket No. 384, Decision of the Administrator on the Suspension of Heptachlor-Chlordane at p. 28–29 (December 24, 1975)).

Because the data indicate that benzidine does not persist in the water column following discharge and to date has not been detected in the aquatic environment of the United States, and considering the inherent limitations of the low-dose extrapolation approach discussed above, the Agency decided that it would not be necessary to set a criterion at the lower level (0.05 μg/l) of the range indicated by the extrapolation modeling. Considering the general range indicated by that approach, and the lack of actual direct human exposure from water, the Agency proposed an ambient water criterion of 0.1 μg/l. This level is approximately in the middle of the range. The data set forth in the Agency's statement of basis and purpose indicate that an ambient water criterion at this level will provide an ample margin of safety for human health as well as for aquatic organisms, consistent with the statutory purposes of section 307(a).

In translating the proposed ambient water criterion into an "end-of-pipe" effluent standard, the Agency considered not only the risks of exposure but the behavior of benzidine in the aquatic environment following discharge. (See discussion in preamble to proposed standards, 41 FR 27016–27017.) In addition to benzidine's apparent lack of persistence in the water column, the actual concentration of any substance from a point source does not normally remain in the ambient waters at the same levels of discharge. In fact, for the typical discharge situation, the effluent disperses following discharge and becomes greatly diluted. The area of dilution is often referred to as a "mixing zone" and will vary in size and shape from one body of water to the next. The result of this phenomenon is that the pollutant concentration becomes greatly diluted in the receiving water and may not even be detectable. In most cases, therefore, an effluent standard set at a concentration which is considerably greater than that desired in the ambient water will nevertheless result in achievement of the concentration desired in the ambient water criterion, following dispersion in the mixing zone area.

To deal with situations where the receiving water conditions provide insufficient dispersion and dilution, or a water use exists in such close proximity to a discharge that removal through natural processes is insufficient to provide the ample margin of safety required by the Act, a mechanism in the nature of a "tightening variance" clause was adopted in § 129.7 of the general implementing regulations. This variance clause allows establishment of a more stringent limitation on effluents where the particular characteristics of the local receiving waters so warrant.

Taking into consideration the expected dilution and dispersion, the Agency proposed the toxic pollutant effluent standard for existing and new benzidine manufacturers as follows:

> Discharges from a benzidine manufacturer shall not contain benzidine concentrations exceeding an average per working day of 10 micrograms per liter calculated over any calendar month, and shall not exceed a monthly average daily loading of 0.130 kg/kkg of benzidine produced, and shall not exceed 50 micrograms per liter in a sample(s) representing any working day.

The expected 100 to 1 dilution factor should be readily achievable in most if not all instances. In the event that it is not achieved within the bounds of a reasonable mixing zone, the "tightening variance" clause described above is available to assure the provision of an ample margin of safety, as required by section 307(a) of the Act.

As set forth in the Notice of Proposed Rulemaking (41 FR at 27016), the mass emission standard of 0.130 kilograms per 1,000 kilograms of benzidine produced is based upon the performance of existing plants, and is intended to prevent a manufacturer from discharging larger quantities of benzidine to the environment than under normal careful operations and using dilution alone to comply with the standards.

For users of benzidine-based dyes in the dying of textiles, leather, or paper, the Agency proposed the following standards for existing and new sources:

> Discharges from benzidine-based dye applicators shall not contain benzidine concentrations exceeding an average per working day of 10 micrograms per liter; and shall not exceed 25 micrograms per liter in a sample(s) or calculation(s) representing any working day.

Greater control available to the applicators (including the use of extended aeration or aerated lagoons, as well as the ability to control releases) allows applicators not only to comply with an average standard of 10 μg/l but also to contain any concentration excursions within the bounds of 25 μg/l for any working day. Because the amounts of benzidine in the waste of the applicators are inherently quite small, no mass emission or weight loading limitation is necessary for these categories.

The analytical method acceptable was prescribed as that set forth in 40 CFR Part 136, which has been amended effective April 1, 1977 to provide for the "chloramine-T" method (41 FR 52781, 52785). (Under § 129.8 of the general regulations the compliance date for the benzidine regulations will be December 30, 1977.) For the applicators, an alternative method is allowed, specifically the mass balance monitoring approach, which requires the calculation of the benzidine concentration by dividing the total benzidine contained in dyes used during a working day (as certified on the product label by the manufacturer) by the total quantity of water discharged during the working day. This is set forth in § 129.104(c)(2), as proposed, which provides as follows:

> (2) *Analytical method acceptable.* (i) Environmental Protection Agency method specified in 40 CFR Part 136; or (ii) Mass balance monitoring approach which requires the calculation of the benzidine concentration by dividing the total benzidine contained in dyes used during a working day (as certified on the label by the manufacturer) by the total quantity of water discharged during the working day.
>
> NOTE.—The Regional Administrator (or State Director, if appropriate) may rely entirely upon the method specified in 40 CFR Part 136 in analyses performed by him for enforcement purposes. (41 FR 27017)

In that section as proposed, the amount of the total benzidine contained in dyes used during a working day would be determined by reference to the amount "certified on the label by the manufacturer." Although it is presently standard practice among manufacturers to make such a certification on the label, this may not remain the practice forever. Because some form of written certification will be required for monitoring and enforcement purposes, the words "on the label" in § 129.104(c) have been deleted and replaced with the words "in writing," so as to provide for an alternate means of certification in the event that the practice of certifying on the label is discontinued.

Because of the mass balance approach tends to yield high results, only the chloramine-T method will be used for enforcement purposes. For this reason the word "may" in the Comment to § 129.104(c)(2) should be changed to "shall."

Section 129.104(c)(2) as thus revised provides as follows:

(2) *Analytical method acceptable.* (i) Environmental Protection Agency method specified in 40 CFR Part 136; or (ii) Mass balance monitoring approach which requires the calculation of the benzidine concentration by dividing the total benzidine contained in dyes used during a working day (as certified in writing by the manufacturer) by the total quantity of water discharged during the working day.

COMMENT.—The Regional Administrator (or State Director, if appropriate) shall rely entirely upon the method specified in 40 CFR Part 136 in analyses performed by him for enforcement purposes.

Apart from the need for the foregoing technical modification no evidence was introduced at the hearing which indicates either that the proposed standards do not fully comply with the requirements of section 307(a), or that a modification to the standards as proposed would be warranted "based upon a preponderance of evidence" adduced at the hearing under section 307(a)(2). Accordingly, pursuant to that section, the standards are hereby promulgated as proposed, with the modifications to § 129.104(a)(2) noted.

SOCMA submitted its objections on July 23, 1976. API submitted its objections on July 26, 1976. Both objecting parties were given ample opportunity to supplement their objections with whatever evidence they sought to introduce and present at the proceeding. API submitted in support of its objections the Affidavit of Dr. Nicholas J. Lardieri and SOCMA submitted the Affidavit of Edward Modell.

EPA submitted the Affidavit of Dr. Leonard J. Guarraia, who is the Chief of the Criteria Branch of the Criteria and Standards Division of EPA's Office of Water Planning and Standards. Dr. Guarraia was responsible for the preparation of the EPA Criteria Document for benzidine. EPA also submitted the Affidavit of Dr. Thomas M. Keinath, whose report has previously been described. Both of these witnesses were made available for cross-examination, but neither of the objecting parties chose to cross-examine them, and accordingly their affidavits were submitted into evidence without objection.

The SOCMA objections and comments on page 1 recognize the soundness of the Agency's proposed standards in the following language:

The proposed rulemaking is in general very well designed to achieve the purposes of section 307(a) of the Federal Water Pollution Control Act Amendments of 1972, Pub. L. 92-500. This is particularly welcome because a human carcinogen is involved and the proposed limitations on effluent discharges are carefully derived from the best presently available data and prudent, indeed quite conservative, methods of analysis of risks * * *.

SOCMA requested a monthly average for benzidine-based dye applicators of 20 μg/l rather than 10 μg/l economic grounds. SOCMA indicated further that some dye applicators might exceed this limit on a mass balance monitoring approach, but not on an analytical chloramine-T approach. However, as indicated above only chloramine-T tests will be used for enforcement purposes. If an applicator has reason to believe his effluent concentrations approach or exceed the standard, he should utilize chloramine-T measuring and monitoring technology to assure compliance.

SOCMA also requested an amendment of the standards to provide that where a discharger's waste stream is analyzed and no detectable quantity is found, the benzidine content should be deemed to be zero for monthly averaging purposes. The reason for this request is that some enforcement personnel would regard a non-detectable quantity as indicating the presence of benzidine up to the detectable limit. Since the limit of detectability (2–5 μg/l) is close to the discharge limit (10 μg/l), this practice could result in an apparent violation where in fact there was none. The Agency's practice is to treat a non-detectable amount as zero and hence no amendment is necessary.

API initially objected to the lack of adequate time to prepare its objections. This objection was cured by the allowance of the filing of supplemental data by API on August 9, 1976, which was further supplemented by their Affidavit of Nicholas J. Lardieri admitted as evidence on September 30, 1976.

API also objected to an alleged lack of adequate consultation by EPA with the industry and other government agencies. The Agency believes it adequately consulted with other government agencies concerning the proposed regulations prior to their proposal. With respect to industry, this objection would now appear to be moot since API has been afforded ample opportunity in the scope of these hearings to present to the Agency whatever evidence and information it wished.

API objected to the proposed ambient water criterion of 0.1 μg/l, asserting that the low-dose risk extrapolation models used by the Agency were overly conservative. No further evidence was introduced to support their objection, however, and no evidence was introduced on which the Agency could reasonably conclude that more relaxed standards than those proposed would provide an ample margin of safety for aquatic organisms and consumers thereof, including man. Accordingly, there appears no basis for modifying the Agency's proposed ambient water criterion.

As indicated in both the Supplemental Data on Benzidine Based Dye Usage in the Pulp and Paper Industry filed by API on August 9 and the Affidavit of Nicholas Lardieri, API's principal objection to the proposed benzidine toxic effluent standards is that the paper goods manufacturing industry uses relatively insignificant amounts of benzidine-based dyes, and thus should not be included among the industrial facilities subject to the proposed benzidine regulations. (SOCMA made the same objection.) Although the original objection apparently sought a higher effluent standard based primarily upon effects on aquatic organisms, this was not followed up in either of the subsequent submissions, and indeed would appear to overlook the need for protection against the possible cancer risk to human health. The Supplemental Data and the Affidavit of Dr. Lardieri indicate that the discharges of benzidine by representative plants in the paper products industry are well below the maximum standards proposed by EPA. API argues that because its plants are already in compliance, they should not be subjected to the cost of monitoring.

EPA believes that the cost of mass balance monitoring is quite small, and no evidence was introduced by API at the hearings to the contrary. Whatever minimal costs of monitoring there may be would appear to be justified in order to insure that the industry does in fact continue to comply with the Agency's toxic pollutant effluent standards for benzidine, and thereby assures that the requisite protection of human health from exposure to this proven carcinogen is being provided.

American Cyanamid Company recommended express use of the chloramine-T method for analysis, noting that the "mass balance analysis" monitoring approach often may overstate the amount of benzidine present in a discharge. As noted previously, the chloramine-T method has been adopted as the official method and will be used for enforcement purposes. In view of the cost of acquiring chloramine-T monitoring equipment, and because the mass balance method tends to overstate the amount of benzidine present, it would appear that demonstration of compliance using the mass balance method is sufficient.

The New York State Department of Environmental Conservation recommended that pretreatment standards be established for facilities discharging to publicly owned treatment works (POTWs). As stated in the Notice of Proposed Rulemaking on June 30, 1976, the Agency intends to develop pretreatment standards for discharges of benzidine to POTWs in due course.

The New York State Department of Environmental Conservation also stated that the standards were unreasonably low, and went beyond what is necessary to provide an ample margin of safety for protection of aquatic organisms. They further stated that there was insufficient evidence of any human exposure resulting from point source discharges into the water to warrant setting a standard as low as that proposed for the protection of human health. The Natural Resources Defense Council ("NRDC"), on the other hand, urged that the standards are not low enough, and that for a proven carcinogen the standards should be zero. NRDC submitted no evidence that the

Agency's proposed standards would result in any significant risk of harm to human health, or that measurable additional benefit would be obtained by establishing a zero discharge. In my Final Decision on Toxic Pollutant Effluent Standards for Aldrin/Dieldrin, etc., dated December 30, 1976, I explained in detail the manner in which the Agency evaluates evidence of carcinogenicity and discussed why zero discharge of toxic substances known to be carcinogens is not necessarily required under section 307(a). For the reasons stated there and hereinabove, it would appear that the standards proposed by the Agency will provide an ample margin of safety for human health, and that there is no significant or material evidence which would warrant a modification of that standard under section 307(a)(2).

NRDC also asserted that the Agency should not consider technology or economic impact in setting a standard under section 307(a), and further noted that the present standard is not even based upon the very best technology available. It is true that the Agency gave some consideration to the technological feasibility of complying with its proposed standards. However, the standard proposed for benzidine is fully supportable and reasonable apart from any consideration of technological feasibility or economic impact. The fact that technology may be available to achieve additional pollutant reductions at a given cost does not necessarily mean that the Agency must require installation of that technology when the available data indicate that the "ample margin of safety" required by section 307(a) may be achievable without the implementation of that technology. To put it somewhat differently, if the degree of protection required by the Act can be achieved through promulgation of a particular standard, there is no further legal requirement that more stringent standards be promulgated, just because technology may exist to achieve them. Nor is the Agency required to set standards that furnish an absolute guarantee of safety as distinct from "an ample margin of safety."

NRDC also claimed that the "tightening variance" procedure set forth in § 129.7 of the general implementing regulations proposed on June 10, 1976, is inadequate to assure an ample margin of safety. NRDC offered no evidence to support this proposition and no argument indicating that the proposed variance is legally insufficient. There is no reason to believe that the tightening variance clause will not be utilized in any appropriate case in order to assure compliance with the law, and therefore there appears no justification for modifying this procedure.

NRDC also asserted that the scope of point source discharge coverage was inadequate. As stated in the preamble portion of the Notice of Proposed Rulemaking on June 30, 1976, the proposed standards cover all of the manufacturers of benzidine and benzidine-based dyes. They also cover all known significant users or applicators. There may or may not be other significant discharges of benzidine into the navigable waters, but to the Agency's knowledge they have not been identified. The designation of the point source categories covered by the proposed standards is properly within the Administrator's discretion pursuant to section 307(a)(5), which states that "when proposing or promulgating any effluent standard (or prohibition) under this section, the Administrator shall designate the category or categories of sources to which the effluent standard (or prohibition) shall apply." It is believed that the proposed coverage includes all significant point source discharges of benzidine into the navigable waters.

Ford Motor Company opposed the setting of national standards, and urged the setting of standards on a site-specific basis. This suggestion must be rejected as contrary to the mandate of section 307(a), which requires the setting of national standards. Variations in particular receiving water conditions have been taken into account by the Agency in its recognition of the mixing zone phenomenon, coupled with the "tightening variance" clause which will be applied on a site-specific basis to assure compliance with the mandate of section 307(a) that an ample margin of safety be provided.

Ford also recommended deletion of the ambient water criterion, since this is not required under section 307(a) and would be more properly issued as a recommendation pursuant to section 304(a). It is true that the Agency publishes recommended water quality criteria under section 304(a), and it is also true that the establishment of an ambient water criterian is not legally required under section 307(a). However, because toxicity is largely a function of concentration of a pollutant in ambient waters, the Agency has decided that the establishment of toxic pollutant effluent standards is a helpful step in relating the required "end-of-pipe" effluent standard to the effects which are to be minimized or avoided. In addition, the establishment of the ambient water criterion will enable the Agency to achieve some degree of site-specific flexibility in its standards by assuming a reasonable degree of dispersion and dilution, while at the same time retaining the power under the "tightening variance" clause to assure that more stringent limitations are applied where necessary to insure the provision of an ample margin of safety for those organisms for whose protection section 307(a) was intended.

CONCLUSION

Substantial evidence on the record taken as a whole strongly supports promulgation of the standards as proposed by the Agency. Moreover, there does not appear to be any need or justification for any modification of the toxic pollutant standards proposed for benzidine "based upon a preponderance of evidence" adduced at the hearings, except for the modification of § 129.104(c)(2) discussed above relating to certification by the manufacturer and use of the chloramine-T method for enforcement purposes.

Also, in subsections (b)(1)(i)(B)(1) and (c)(1)(i)(B)(1) of § 129.104 as proposed, there was the following language setting forth the application of the standards to stormwater and other runoff:

> These standards or prohibitions apply to:
>
> * * * * *
>
> (B) All discharges from the manufacturing areas, loading and unloading areas, storage areas and other areas which are subject to direct contamination by benzidine as a result of the manufacturing process, including but not limited to stormwater and other runoff.

Subsection (ii) of each of those sections then provided as follows:

> These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of benzidine; or to stormwater runoff that exceeds that from the ten year 24-hour rainfall event.

For clarification, each of the subsections mentioned above should be amended by inserting after the words "stormwater and other runoff" the following language: "except as hereinafter provided in subsection (ii)".

Accordingly, the standards are hereby adopted in the form set forth below.

Dated: December 30, 1976.

Effective date: The amendment as hereinafter promulgated will become effective January 12, 1977. Due to the operation of § 129.8, the compliance date for the standards promulgated below will be January 12, 1978.

RUSSELL E. TRAIN,
Administrator.

1. In 40 CFR Part 129, Subpart A (as proposed at 41 FR 23576 (June 10, 1976)), is amended by adding a new entry to the table of contents to read as follows:

Sec.
129.104 Benzidine.

2. Subpart A of Part 129 is further amended by adding a new paragraph (e) to § 129.4 to read as follows:

§ 129.4 Toxic pollutants.

* * * * *

(e) Benzidine—"Benzidine" means the compound benzidine and its salts as identified by the chemical name 4,4'-diaminobiphenyl.

3. Subpart A of Part 129 is further amended by adding a new § 129.104 to read as follows:

§ 129.104 Benzidine.

(a) *Specialized definitions.* (1) "Benzidine Manufacturer" means a manufacturer who produces benzidine or who produces benzidine as an intermediate product in the manufacture of dyes commonly used for textile, leather and paper dyeing.

(2) "Benzidine-Based Dye Applicator" means an owner or operator who uses benzidine-based dyes in the dyeing of textiles, leather or paper.

(3) The ambient water criterion for benzidine in navigable waters is 0.1 μg/l.

(b) *Benzidine manufacturer*—(1) *Applicability.* (i) These standards apply to:

(A) All discharges into the navigable waters of process wastes, and

(B) All discharges into the navigable waters of wastes containing benzidine from the manufacturing areas, loading and unloading areas, storage areas, and other areas subject to direct contamination by benzidine or benzidine-containing product as a result of the manufacturing process, including but not limited to:

(*1*) Stormwater and other runoff except as hereinafter provided in paragraph (b)(1)(ii) of this section and

(*2*) Water used for routine cleanup or cleanup of spills.

(ii) These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of benzidine; or to stormwater runoff that exceeds that from the ten year 24-hour rainfall event.

(2) *Analytical method acceptable*—Environmental Protection Agency method specified in 40 CFR Part 136.

(3) *Effluent standards*—(i) *Existing sources*—Discharges from a benzidine manufacturer shall not contain benzidine concentrations exceeding an average per working day of 10 μg/l calculated over any calendar month, and shall not exceed a monthly average daily loading of 0.130 kg/kkg of benzidine produced, and shall not exceed 50 μg/l in a sample(s) representing any working day.

(ii) *New sources*—Discharges from a benzidine manufacturer shall not contain benzidine concentrations exceeding an average per working day of 10 μg/l calculated over any calendar month, and shall not exceed a monthly average daily loading of 0.130 kg/kkg of benzidine produced, and shall not exceed 50 μg/l in a sample(s) representing any working day.

(4) The standards set forth in this paragraph (b) shall apply to the total combined weight or concentration of benzidine, excluding any associated element or compound.

(c) *Benzidine-based Dye Applicators*—(1) *Applicability.* (i) These standards apply to:

(A) All discharges into the navigable waters of process wastes, and

(B) All discharges into the navigable waters of wastes containing benzidine from the manufacturing areas, loading and unloading areas, storage areas, and other areas subject to direct contamination by benzidine or benzidine-containing product as a result of the manufacturing process, including but not limited to:

(*1*) Stormwater and other runoff except as hereinafter provided in paragraph (c)(1)(ii) of this section and

(*2*) Water used for routine cleanup or cleanup of spills.

(ii) These standards do not apply to stormwater runoff or other discharges from areas subject to contamination solely by fallout from air emissions of benzidine; or to stormwater that exceeds that from the ten year 24-hour rainfall event.

(2) *Analytical method acceptable.* (i) Environmental Protection Agency method specified in 40 CFR Part 136; or

(ii) Mass balance monitoring approach which requires the calculation of the benzidine concentration by dividing the total benzidine contained in dyes used during a working day (as certified in writing by the manufacturer) by the total quantity of water discharged during the working day.

(COMMENT: The Regional Administrator (or State Director, if appropriate) shall rely entirely upon the method specified in 40 CFR 136 in analyses performed by him for enforcement purposes.)

(3) *Effluent standards*—(i) *Existing sources*—Discharges from benzidine-based dye applicators shall not contain benzidine concentrations exceeding an average per working day of 10 μg/l calculated over any calendar month; and shall not exceed 25 μg/l in a sample(s) or calculation(s) representing any working day.

(ii) *New sources*—Discharges from benzidine-based dye applicators shall not contain benzidine concentrations exceeding an average per working day of 10 μg/l calculated over any calendar month; and shall not exceed 25 μg/l in a sample(s) or calculation(s) representing any working day.

(4) The standards set forth in this paragraph (c) shall apply to the total combined concentrations of benzidine, excluding any associated element or compound.

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